МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ
НАЦІОНАЛЬНИЙ ТЕХНІЧНИЙ УНІВЕРСИТЕТ УКРАЇНИ
«КИЇВСЬКИЙ ПОЛІТЕХНІЧНИЙ ІНСТИТУТ
імені ІГОРЯ СІКОРСЬКОГО»

Англійська мова професійного спрямування

CEMENT MAKING

Практикум

Рекомендовано Методичною радою КПІ ім. Ігоря Сікорського
як навчальний посібник для студентів,
які навчаються за спеціальністю 161 «Хімічна технологія»

Київ
КПІ ім. Ігоря Сікорського
2018

Англійська мова професійного спрямування: Cement Making [Електронний ресурс]: практикум для студентів спеціальності 161 «Хімічна технологія» / КПІ ім. Ігоря Сікорського; уклад.: С. М. Бобровник. – Електронні текстові данні (1 файл: 1999 Мбайт). – Київ: КПІ ім. Ігоря Сікорського, 2018. – 64 с.

Гриф надано Методичною радою КПІ ім. Ігоря Сікорського (протокол № 1 від 27.09.2018 р.) за поданням Вченої ради ФЛ (протокол № 13 від 25.06.2018 р.)

Електронне мережне навчальне видання

АНГЛІЙСЬКА МОВА ПРОФЕСІЙНОГО СПРЯМУВАННЯ
CEMENT MAKING
ПРАКТИКУМ

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Анотація. Практикум для студентів третього курсу хіміко-технологічного факультету укладено відповідно до чинної програми з дисципліни «Іноземна мова», яка передбачає формування у студентів комунікативної компетенції, необхідної для ефективної участі в процесі навчання та в різноманітних ситуаціях професійного спілкування.

Мета практикуму – розширення та закріплення студентами загально технічної термінологічної лексики та опанування граматичними конструкціями, що дозволяють розуміти автентичні тексти, пов'язані з навчанням та спеціальністю. Розроблений практикум сприяє систематизації іншомовного навчального матеріалу, формуванню навичок, розвитку та удосконаленню вмінь у читанні, говорінні, письмі, аудіюванні та перекладі.

КПІ ім. Ігоря Сікорського, 2018

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Передмова

Практикум укладено відповідно до робочої навчальної програми кредитного модуля «Англійська мова професійного спрямування», розробленої для студентів напряму підготовки 6.051301 «Хімічна технологія», спеціальності 8.092502 «Технологія композитних матеріалів», спрямований на розвиток навичок читання, письма, аудіювання, говоріння та перекладу науково-технічних текстів за профілем названого напряму підготовки**.**

Практикум складається з п’яти розділів. Кожний розділ включає в себе тексти, доповнені лексичними та граматичними завданнями для відпрацювання лексики та граматичних структур, які часто використовуються в технічній літературі. Крім того, у кожному розділі є завдання творчого характеру: написання доповідей, опис графіків, створення речень, тощо. Підбір текстів та вправи забезпечують достатню повторюваність термінології цієї спеціальності, забезпечується логічною і послідовною структурою видання.

Інформаційно-насичений пізнавальний матеріал та виконання різноманітних лексичних завдань сприятимуть підвищенню мотивації студентів до вивчення англійської мови як під час практичних занять, так і в процесі підготовки домашніх завдань. Виконання студентами завдань практикуму сприятиме інтенсифікації процесу вивчення англійської мови та розуміння науково-технічної професійно-орієнтованої літератури.

UNIT 1

PRINCIPLE OF PRODUCTION AND USE OF CEMENT

❖ Lead-in

I. Discuss the following questions.

1. What is the most popular construction material nowadays?
2. What images spring to mind when you hear the word cement?
3. What associations do you have with cement?
4. What can substitute cement?
5. What equipment is needed to produce cement?

II. Look at the picture and describe what you see on it. The text below will be helpful.

Cement production line (cement plant) is a production line composed by a series of cement equipment. The process of cement production line mainly consists of crushing and prehomogenization raw material homogenizing, preheating decomposition, cement clinker burning, cement grinding and packaging.

The main cement equipment includes cement rotary kiln, cyclone preheater and grate type cooler.

❖ **Reading**

III. Read the text and name the main stages of cement making which you remembered.

PRINCIPLE OF PRODUCTION AND USE OF CEMENT

Cement is a hydraulic **binder**, i.e. an inorganic, non-metallic, **finely ground** substance which, after mixing with water, sets and hardens independently as a result of chemical reactions with the mixing water and, after **hardening**, it retains its strength and **stability** even under water. The most important area of application is therefore the production of **mortar** and **concrete,** i.e. the bonding of natural or **artificial** aggregates to form a strong building material which is durable in the face of normal environmental effects. The difference between mortar and concrete is governed by the particle size of the aggregate, which is mortar has a maximum value of about 4 mm and in concrete can be as large as 32 mm but in special cases may be smaller or larger.

Hydraulic hardening is caused primarily by the formation of calcium silicate hydrates. Cements therefore consist of those substances or mixtures of substances which, through reaction with the mixing water, form calcium silicate hydrates sufficiently **rapidly** in a quantity **sufficient** to provide strength and **durability.** However, other compounds, e.g. calcium aluminates, may also participate in the hardening process.

An early version of cement made with lime, sand, and gravel was used in Mesopotamia in the third millennium B.C. and later in Egypt. It is uncertain where it was first discovered that a combination of hydrated non-hydraulic lime and apozzolan produces a hydraulic mixture, but concrete made from such mixtures was used by the Ancient Macedonians and three centuries later on a large scale by Roman engineers. They used both natural pozzolans (trass or pumice) and artificial pozzolans (ground brick or pottery) in these concretes. The huge dome of the Pantheon in Rome and the massive Baths of Caracalla are examples of ancient structures made from these concretes, many of which are still standing. The vast

system of **Roman aqueducts** also made extensive use of hydraulic cement. Although any preservation of this knowledge in literary sources from the Middle Ages is unknown, medieval masons and some military engineers maintained an active tradition of using hydraulic cement in structures such ascanals, fortresses, harbors, and shipbuilding facilities. This technical knowledge of making hydraulic cement was later formalized by French and British engineers in the 18th century.

John Smeaton made an important contribution to the development of cements when he was planning the construction of the third Eddystone Lighthouse (1755–59) in the English Channel now known as Smeaton's Tower. He needed a hydraulic mortar that would set and develop some strength in the twelve hour period between successive high tides. He performed experiments with combinations of different limestones and **additives** including trass and pozzolanas and did **exhaustive market** research on the available hydraulic limes, visiting their production sites, and noted that the "hydraulicity" of the lime was directly related to the clay content of the limestone from which it was made. Smeaton was a civil engineer by profession, and took the idea no further.

In Britain particularly, good quality building stone became ever more expensive during a period of rapid growth, and it became a common practice to construct prestige buildings from the new industrial bricks, and to finish them with a stucco to imitate stone. Hydraulic limes were **favored** for this, but the need for a fast set time encouraged the development of new cements. Most famous was Parker's "Roman cement". This was developed by James Parker in the 1780s, and finally patented in 1796. It was, in fact, nothing like material used by the Romans, but was a "natural cement" made by burning septaria – nodules that are found in certain clay deposits, and that contain both clay minerals and calcium carbonate. The burnt nodules were ground to a fine powder. This product, made into a mortar with sand, set in 5–15 minutes. The success of "Roman cement" led other manufacturers to develop rival products by burning artificial hydraulic lime cements of clay and chalk. Roman cement quickly became popular but was largely replaced by Portland cement in the 1850s.

In Russia, Egor Cheliev created a new binder by mixing lime and clay. His results were published in 1822 in his book *A Treatise on the Art to Prepare a Good Mortar* published in St. Petersburg. A few years later in 1825, he published another book, which described the various methods of making cement and concrete, as well as the benefits of cement in the construction of buildings and embankments.

Based on Cement by Fridrich W. Locher

IV. Read the text for the second time and find answers to the following questions.

1. What are the ingredients of cement?
2. What causes hydraulic hardening?
3. What provides strength and durability to cement?
4. What country was an early version of cement used in?
5. What contribution into cement making was made by John Smeaton?

V. Choose the best endings to the following sentences.

1. The burnt nodules were	a) manufacturers to develop rival products.
2. This product, made into a mortar with sand,	b) to the development of cements.
3. The success of "Roman cement" led other	c) set in 5–15 minutes.
4. He made an important contribution	d) stability even under water.
5. This product retains its strength and	e) ground to a fine powder
6. The vast system of aqueducts	f) is governed by the particle size of the aggregate.
7. The difference between mortar and concrete	g) also made extensive use of hydraulic cement.

Language Development

VI. Find the correct translations to the following words.

1. bond	a) штучний
2. harden	b) зв'язок
3. rapid	c) прихильність
4. sufficient	d) сукупність
5. durability	e) бетон
6. affect	f) впливати
7. concrete	g) зміцнювати
8. artificial	h) швидкий
9. favour	i) достатній
10. aggregate	j) витривалість, довговічність

VII. Make up your own sentences with the following words and phrases:

do someone a favor; in one's favor; in favor of; have an effect on; the reliability and durability of; harden, rapid, quantity of; developed by, famous for, concrete reinforcement; concrete aggregate.

VIII. Match the terms to the definitions.

1. artificial	a) a whole formed by combining several (typically disparate) elements;
2. concrete	b) acting or moving quickly; fast;
3. rapid	c) to make or become tougher and more clearly defined;
4. sufficient	d) the amount or number of a material or abstract thing not usually estimated by spatial measurement;
5. durability	e) made or produced by human beings rather than occurring naturally, especially as a copy of something natural;
6. aggregate	f) a building material made from a mixture of broken stone
7. harden	g) as much as needed;
8. bond	h) the ability to withstand wear, pressure, or damage;
9. quantity	i) to fix two things firmly together;
10. favour	j) an attitude of approval or liking.

IX. Choose the proper words to fill in the gaps.

Affect, sufficient, durability, artificial, mill, strength.

1. He did not want his life to be prolonged by _____ means. 2. They _____ me deeply. 3. As a result of honey consumption the _____ of organism systems and organs increases. 4. Do you have the _____ to lift this weight? 5. He had not _____ courage for it. 6. A _____ is a building in which grain is crushed to make flour.

X. Find the synonyms to the following words.

1. Grind	a) link
2. bond	b) mill
3. harden	c) manmade
4. rapid	d) adequate
5. sufficient	e) duration
6. durability	f) confuse
7. affect	g) influence
8. strength	h) power
9. artificial	i) fast
10. Mix	j) toughen

XI. Find the opposites to the following words.

1. primary	a) soften
2. sufficient	b) disconnect
3. rapid	c) breakable
4. harden	d) instability
5. durable	e) natural
6. bond	f) weakness
7. stability	g) insufficient
8. artificial	h) slow
9. mix	i) separate
10. strength	j) unimportant

XII. Study these phrases and make up your sentences with them.

to cement together — зкріплювати що-н. за допомогою цемента

to cement a friendship —скріплювати дружні стосунки

the bonds of oppression — кайдани гніту

the bonds of injustice — тягар несправедливості

spiritual bond — духовний зв'язок

to form a bond — встановлювати зв'язок

to strengthen a bond (of friendship) — зкріплювати (дружні стосунки)

❖ **Grammar**

XIII. Complete the passage using either active or passive forms of the verb.

A. Manufacturing resource planning – MRP – is a process which 1_____ (integrate) marketing, production and sales. MRP 2 _____ (rely) upon a fully integrated process and 3_____ (coordinate) by a master scheduler, who 4_____ (ensure) that each of the three phases 5_____ (manage) cost-effectively and efficiently. In MRP, all the projections, estimates and forecasts have to 6_____ (synthesize) in a production plan into concrete stages and mixes of products, whose manufacture has to 7 _____ (schedule) as cost-effectively as possible, using just-in-time and electronic data interchange systems.

B. Blow-moulding 8 _____ (use) to make bottles. In this process, air 9 _____ (blow) into a blob of molten plastic inside a hollow mould and the plastic 10 _____ (force) against the sides of the mould. Toys and bowls 11 _____ (make) by injection moulding. Chips 12 ____ (heat) until they melt. They 13 _____ (squeeze) together in a heated press.

❖ **Translation**

XIV. Translate the following sentences into Ukrainian and pay attention to the translation of the new words.

1. Religion has functioned as the **cement** of society throughout the history of the country. 2. Population is **aggregated** in small villages. 3. The rate of growth of

GNP will depend upon the rate of growth of **aggregate** demand. 4. England has beaten the Welsh three times in succession with an **aggregate** score of 83-12. 5. The experience created a very special **bond** between us. 6. They all **bonded** while writing graffiti together. 7. What had **bonded** them instantly and so completely was their similar background. 8. The players are **bonded** by a spirit that is rarely seen in an English team. 9. The city is dotted with small lakes, natural and **artificial**. 10. He did not want his life to be prolonged by **artificial** means.

XV. Translate the following sentences from Ukrainian into English.

На сьогоднішній день цемент є найбільш затребуваним і популярним будівельним матеріалом, без якого неможлива жодна будівництво. Але мало хто знає технологію виробництва цементу, а адже ці знання можуть бути дуже корисними. Цемент — це штучний матеріал, який отримують в результаті з'єднання гіпсу, глини, вапняку і різних мінеральних добавок. У загальному вигляді процес створення цементу відбувається наступним чином: спочатку відбувається видобуток сировини та її транспортування на завод. Потім сировинний матеріал подрібнюють і перемелюють. Після цього готується сировинна суміш. І останнім етапом є помел клінкеру, додавання в нього різних необхідних добавок. Однак даний процес може відбуватися за різними технологіями.

Listening

XVI. Watch the video "Manufacture of Portland Cement" (https://www.youtube.com/ watch?v=dyxL_BvkhJg) and answer the following questions.

1. What materials are required for cement manufacture?
2. Describe wet process of cement manufacture.
3. Describe dry process of cement manufacture.
4. What is Rotary Kiln? Dwell on its function in the process of cement making.
5. What is clinker?

❖ **Writing**

XVII. The diagram below shows the stages and equipment used in the cement-making process, and how cement is used to produce concrete for building purposes. Summarise the information by selecting and reporting the main features and make comparisons where relevant. (100-150 words).

Study the following constructions for describing graphs and describe this graph according to the structure below.

The graph shows…

In contrast, …

Overall, …

Making an overview statement: *We can see from the chart that…, the chart shows;*

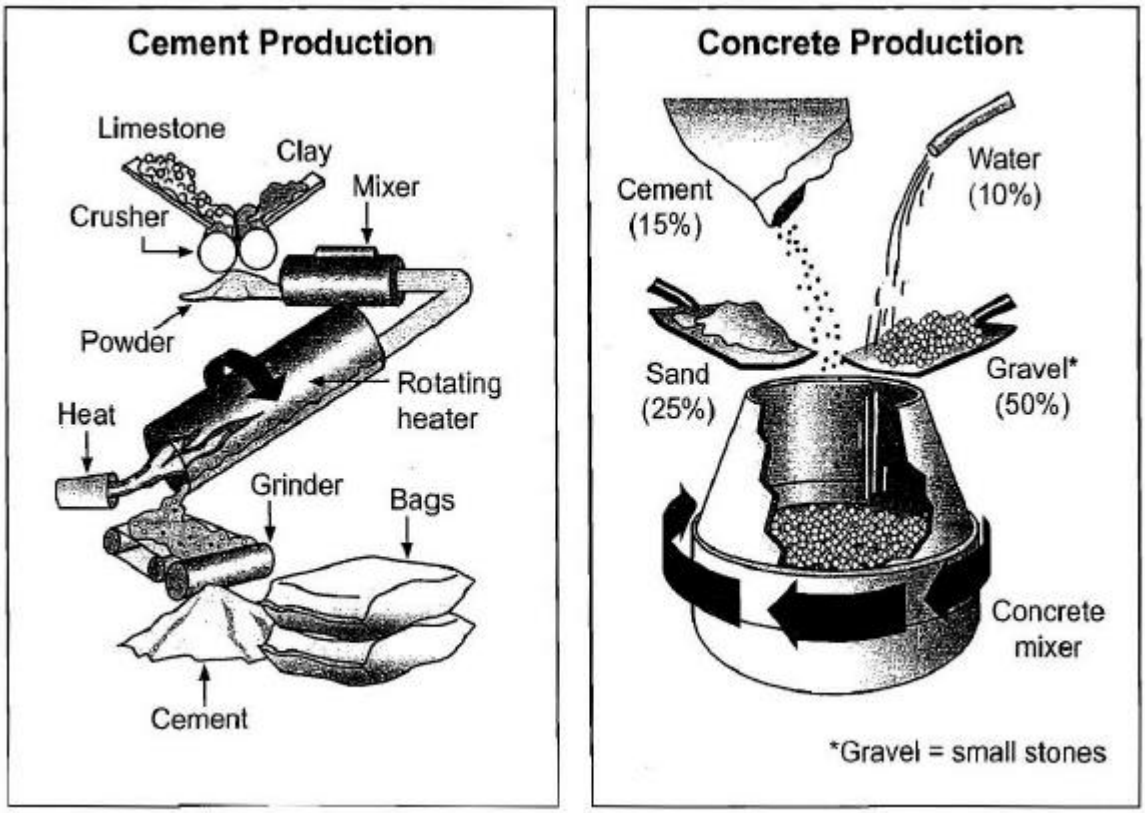
Introducing overall trends: *Looking at the figures we can see that…, from overall perspective…, one of the first things we can see that…, it's true to say that…, one thing that clearly stands out is…,it's interesting to see that…, a striking point is.*

Approximating: *approximately/ about/ roughly/ just above/ a little/ slightly less/ more than.*

Introducing supporting details: *for example/ for instance/ moreover/ when we look at/ more specifically.*

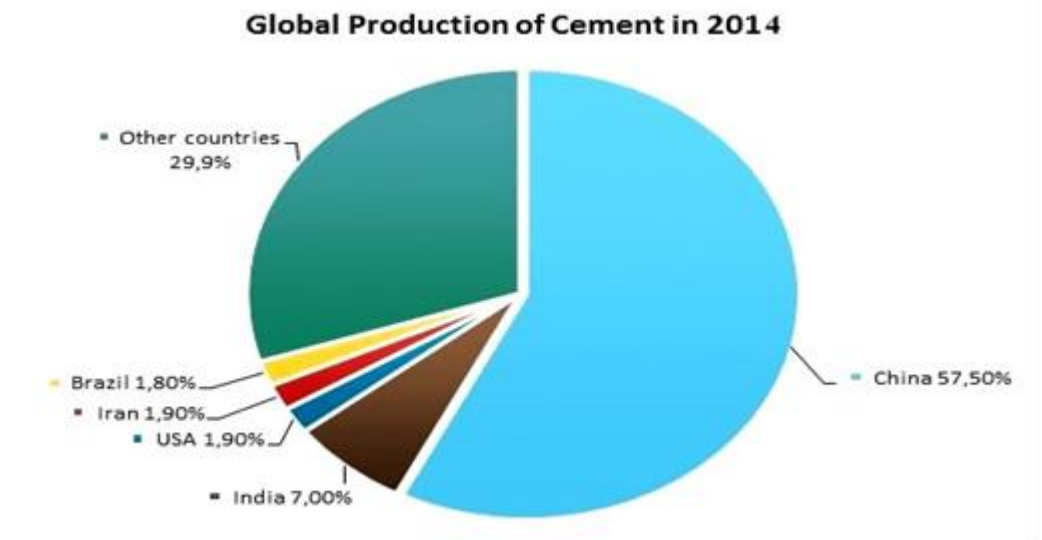
Introducing a point of interest: *it is interesting to see that/ a sticking point is that/ interestingly, surprisingly.*

Comparing data: *there is three times as much as X as Y/ in comparison to X, Y is / the percentage amount/ quantity of X is (not)… than Y/ there are twice as many X than Y.*



❖ **Speaking**

XVIII. Study this pie chart and describe the global production of cement in 2014. Use the phrases from exercise XVI which can be helpful to summarize the information by selecting and reporting the main features and make comparisons where relevant.



XIX. Imagine that you are a customer and want to buy equipment for cement making plant. Work in pairs and make up a dialogue between a customer and seller about the purchase. Dwell on the advantages and disadvantages of every model and explain the purpose and function of each machine. (Study the example of the dialogue below).

Buyer: Hey!

Seller: Hello, Sir. Can I help you?

Buyer: I am here to buy … . Could you please help me with that?

Seller: Sure. Which …. do you want?

Buyer: Could you tell me about …. So that I could decide which one I want to buy/ to order.

Seller: Sure. We'll have a look at….

Buyer: How much is…?

Seller: The price for this will be …

Buyer: What are the advantages and disadvantages of the…?

Seller: The biggest advantage of …

Buyer: I will make the complete payment by check.

Seller: Sure. We will get your order ready in a while.

UNIT 2

HISTORY OF CEMENT

❖ **Lead-in**

I. Do you have any idea about the most wide-spread construction material of the ancient times? What do you know about the history of cement and other building materials? What are the components of cement?

II. Look at the picture and guess what ingredients of cement were used in ancient times and what ingredients are used nowadays.

❖ **Reading**

III. Read the following text and name no less than three historical facts which you remembered, translate the words in bold and explain them.

HISTORY OF CEMENT

The name "cement" **goes back** to the Romans who used the term "opus caementitium" to describe masonry which resembled concrete and was **made from** crushed rock with burnt lime as the binder. The volcanic ash and pulverized brick additives which were **added to** the burnt lime to obtain a hydraulic binder were later **referred to** as cementum, cimentum, cament and cement.

The significance of the clay content for the hydraulic properties of the hydraulic lime produced from natural mixture of limestone and clay was discovered

by the Englishman John Smeaton (1724-1792) when he was preparing to build the Eddystone lighthouse near Plymouth and was looking for a **binder for water-resistant mortar**. In 1796 his compatriot James Parker used the name "Roman cement" for the Roman lime which he burnt from the marl nodules in London septarian clay. The Frenchman Louis-Joseph Vicat (1786-1861) and the German Johann Friedrich John (1782-1847) discovered independently of one another that mixtures of limestone and 25 to 30% by mass of clay were the most **suitable for** producing hydraulic lime. The **binder** which Joseph Aspdin (1778-1855) produced by burning an artificial mixture of limestone and clay, and for which he obtained a **patent** in 1824 under the name of "Portland cement", also at first corresponded in composition and properties to a Roman lime, as it had not yet been burnt to the **sintering point.** The artificial rock produced from it **resembled** Portland stone, an oolitic **limestone** which is **quarried on** the Portland **peninsula** in the county of Dorset on the Channel coast. When William Aspdin, the son of Joseph Aspdin, started to produce Portland cement in 1843 in a newly established works at Rotherhithe near London it became apparent, especially during the construction of the Houses of Parliament London, that this was far superior to "Roman cement". This was mainly because a **considerable** proportion of the mix had been **sintered** during the burning process. The significance of this sintering had apparently been first recognized in 1844 by Isaac Charles Johnson (1811-1911).

The first German Portland cement on the English pattern was produced in Buxtehude in 1850. However, the basis for the manufacture of Portland cement in Germany was provided by Hermann Bleibtreu (182401881), who also built two cement works in Zullchow near Stettin (18550) and in Oberkassel near Bonn (1858).

In France the manufacture of Portland cement started around 1850 when a slow-setting binder was obtained from the sintered residues produced during the **slaking** of burnt lime by grinding them between mill stones.

Sintered cement clinker was first manufactured in the USA around 1870 by David Saylor who **comminuted** the raw material to **homogenize** it, and **moulded** the meal into **bricks** for **burning**.

Wilhelm Michaelis (1840-1911) had a crucial influence on the continued development of cement. In his book “Diehydrauischen Mortel” (The hydraulic mortar) published in 1868 he was the first to give accurate data on the most favorable composition for the raw material mix. Information about the lime limit, i.e. the highest possible CaO content in the raw material mix which can be combined with SiO_2, $Al2O_1$ and $Fe2O_3$ during the burning, and about the processes occurring during the burning and cooling of cement clinker was first provided by the investigations of the brothers S.B. and W.B. Newberry (1897) as well as by E.Wetzel (1911-1914), E.Spohn (1932).

Based on Cement by Fridrich W. Locher

IV. Read the text for the second time and find the answers to the following questions.

1. What substances were added to obtain a hydraulic binder?
2. Who discovered the significance of clay content for hydraulic properties of lime?
3. When did Joseph Aspdin obtain a patent?
4. When did Wiliam Aspdin start to produce Portland cement?
5. When was the first German Portland cement on the English pattern produced?

V. Decide whether the following sentences true or false.

1. The first building material resembled concrete and was made from crushed rock with burnt lime as the binder.
2. The name “cement” goes back to Mesopotamia.
3. In France the manufacture of Portland cement started in XVII century.
4. The significance of the clay content for the hydraulic properties of the hydraulic lime produced from natural mixture of limestone and clay was discovered by the German.
5. Cement clinker was first manufactured in the USA in XIX century by David Saylor who comminuted the raw material, and moulded it into bricks for burning.

VI. Translate the words which are in bold in the text and explain them using your own words.

VII. Match the beginnings with the endings of the following sentences.

1. They produced the binder by burning	a) market since nearly ten years.
2. These products have been on the	b) of cement making.
3. It was patented in 1899	c) over one hundred years old.
4. There are two main methods	d) supports the building and gives it stability.
5. The major elements of a building include the foundation, which	e) by the German pharmaceutical company, Bayer.
6. They support the floors and the roof	f) an artificial mixture of limestone and clay

❖ **Language Development**

VIII. Find the correct translations to the following words.

1. crush	a) осад
2. brick	b) здобувати
3. cooling	c) цеглина
4. provide	d) форма
5. investigation	e) розслідування
6. sinter	f) спікати
7. mould	g) вапняк
8. lime	h) постачати
9. obtain	i) охолодження
10. residue	j) роздавлювання

IX. Match the terms with their definitions.

1. Cooling 2. residue 3. provide 4. investigation 5. burn 6. mould 7. lime 8. obtain 9. crush 10. brick	a) formal or systematic examination or research; b) to put at the disposal of; furnish or supply; c) soothing or refreshing because of its low temperature; d) a small rectangular block typically made of fired or sun-dried clay, used in building; e) a small amount of something that remains after the main part has gone or been taken or used; f) get, acquire g) a white caustic alkaline substance consisting of calcium oxide; h) a hollow container used to give shape to molten or hot liquid material when it cools and hardens; i) flame or glow while consuming a material such as coal or wood; j) to press it very hard so that its shape is destroyed or so that it breaks into pieces.

X. Complete the sentences using the following words: *tension, order, required, forced, overcome, steel, provide, investigation, moulded, mould.*

1. Too often some parents try to _____their children into something they do not wish to be. 2. The cheese was _____ in big balls. 3. These companies _____ them with all necessary equipment. 4. The _____ is still going on. 5. Reinforced concrete (RC) structures contain _____ bars. 6. As steel is strong in tension, reinforcing bars _____ this weakness. 7. In _____ to form the different parts of structures, formwork – sometimes also called shuttering – is used. 8. This consists of moulds of the _____ size and shape, made from steel or timber. 9. The mind cannot be always in a state of intellectual _____. 10. The loss of money _____ her to sell her house.

XI. Fill in the appropriate word from the list below to complete the phrases. Use the word(s) only once.

Suitable for, look for, go back, produced, resembled, quarried on, development, added to.

1. they needed to ….. funds;
2. hydraulic lime ….. from natural mixture;
3. material which is ….. producing cement;
4. with ….. of technology;
5. artificial rock …. stone;
6. additives which were ….. the burnt lime;
7. ….. to the Romans;
8. limestone which is ….. the Portland peninsula.

XII. Find the synonyms to the following words.

1. Investigate	a) important
2. bind	b) scrutinize
3. resemble	c) production
4. burn	d) incinerate
5. considerable	e) crush
6. industrial	f) connect
7. comminute	g) look alike
8. return	h) go back
9. gain	i) obtain
10. sinter	j) frit

❖ **Grammar**

XIII. Choose the correct word in bold.

A. The number of people who work in the construction industry (1) **manufactured/manufacturing** industry in the UK has fallen (2) **considerable/considerably** over the last 50 years. Today, it employs (3)

approximately/approximate 130,000 people. Construction materials have always been (4) **important/importantly** but today there is increasing/increasingly trade in construction materials for (5) **industrial/industrially** applications. The export of construction products has remained fairly (6) **constantly/constant** over the last 15 years. The UK also has a (7) **significant/significantly** construction industry, which produces over $200 million worth of goods (8) **annual/annually.**

B. We will carry on with the work when the conditions (9) **improve/ will improve.** If we had known the weather was going to be this bad, we (10) **would/would have delayed** the start of the project. If the rain **will stop/stops**, we will get the foundations laid by evening. It could have been worse. If we (11) **hadn't built/ didn't build** the dike of sandbags, the river would have flooded the town. Provided it (12) **stopped/stops** raining soon, we will be able to start preparing the timber.

❖ **Translation**

XIV. Translate the following sentences into Ukrainian and pay attention to the translation of the new words from the text.

1. The sticks of wood were **bound** together in bunches. 2. Too often we try to mould our children into something they do not wish to be. 3. Parcels must be properly **bound up** for posting to other countries. 4. Always using the same shampoo means that a **residue can** build up on the hair. 5. Employers usually decide within five minutes whether someone is **suitable** for the job. 6. There is no way that we can **provide** another teacher for that class. 7. Has every member of the family been equally **provided for**? 8. Steps can be taken to **provide** against a severe winter. 9. The expenses are **provided** for in the budget. 10. The new law **provides** for equality of human rights.

XV. Translate the following sentences from Ukrainian into English.

При виробництві цементу мокрим способом, сировиною для виробництва клінкеру є твердий вапняковий і м'який глинистий компоненти. Спершу відбувається дуже ретельне подрібнення сировини, адже тільки з

найдрібніших частинок можна отримати по-справжньому однорідний клінкер. Подрібнення сировини відбувається в кілька етапів, адже найчастіше вихідні розміри сировинних матеріалів досить великі, і спершу доводиться пропускати великі шматки через дробарки, а потім отримані дрібні шматочки пропускають через млини, це залежить від вихідних матеріалів. Наприклад, глинистий матеріал перемелюють в млинах.

❖ **Listening**

XVI. Watch the video "Cement, how it is made" https://www.youtube.com/watch?v=n-Pr1KTVSXo and answer the following questions.

1. What does the process of miming involve?
2. How are huge rocks transported?
3. What is known as homogenization?
4. Where does raw material milling take place?
5. Why is gypsum added to cement?

❖ **Writing**

XVII. Write a report about the history of cement and cement making (100-150 words). Consult the Appendix on page 58.

❖ **Speaking**

XVIII. Study the table and compile the graph according to the data. Dwell on the leading countries-producers of cement. Use these following phrases in your report: *Looking at the figures we can see that…, from overall perspective…, one of the first things we can see that…, it's true to say that…, one thing that clearly stands out is…,it's interesting to see that…, a striking point is, in comparison to X, Y is/ quantity of X is (not) than Y / there are twice as many X than Y.*

№	Country	cement production, million tons	world share, %
1	 China	1038	44,9
2	 India	217	9,4
3	 USA	100	4,3
4	 Japan	69	3,0
5	 Iran	65	2,8
6	 South Korea	51	2,2
7	 Spain	50	2,2

XIX. Imagine your firm wants to spend money on improving facilities in the cement making plant and you need new machinery. Work in pairs and create a dialogue between a customer and suppliers.

UNIT 3

BURNING THE CEMENT CLINKER

❖ **Lead-in**

I. **Work in pairs and ask your partner the following questions: What are the main components of cement? How and where are materials for cement taken? What images spring to mind when you hear the word "clinker"?**

II. **Look at the pictures and decide what equipment it is and what it is used for. Describe other equipment needed for production of cement.**

❖ **Reading**

III. **Read the text and underline all historical facts which are mentioned in the text and be ready to discuss them.**

BURNING THE CEMENT CLINKER.
COMMINUTION OF RAW MATERIALS AND CEMENT

Shaft kilns which operated intermittently, were the only means available at first for the burning process. The first step towards continuous operation was the introduction of the Hoffmann annular**.** The term "cement clinker" also came from this period as the kiln feed for burning in annular kilns was formed into bricks which were then burnt in a similar way to **masonry** bricks. The **rotary** cement kiln goes back to patents by the Englishman Frederick Ransome in 1885-86. Burning trials with rotary kilns in German began in 1897, and industrial clinker production started two years later. The first grate preheater kiln (1929) and the first cyclone preheater kiln (1950) also **came on steam** in Germany.

Jaw crushers were used for primary **comminution** of the hard raw materials and the clinker; grinding rolls were used for the rough grinding and millstone arrangements, which consisted of two mill stones with diameter of 0.8 m to 1.5 m on top of one another, for the **fine grinding**. The mill feed was introduced through a central hole in the upper stone and comminuted in the gap between the stationary upper stone and the lower stone, which was driven by a central shaft.

The continued development was aimed primarily at increasing the **fineness** and raising the **throughput**. The cement had to be screened in order to achieve the fineness which at that time **conformed** to the standard of a maximum of 20% residue on 0.2 mm. The grinding units were therefore combined with screening equipment with the disadvantages of high wear and low throughput. Introduction of the mechanical air separator in 1889 was therefore an important improvement.

Further grinding units were, among others, the edge mill for wet processing of the raw material, various types of roller mill and the Griffin mill, a pendulum ring-roller mill adopted from the USA for grinding cement. The head of the pendulum was formed as a grinding roller and circulated in a steel grinding ring. The comminution action was generated by the centrifugal force of the rotating pendulum.

Greater fineness with reasonable **throughput** was achieved principally through the tube mill which was introduced into the German cement industry in 1892. The first tube mills were single chamber mills with diameters of 1.2 m and lengths of 5 m to 6 m. They produced about 3 t cement per hour with a fineness of 15% residue on 0.09 mm and a specific power consumption of 20 k Wht. By 1920 the various types of tube mill had largely displaced the other mill designs for grinding both raw material and cement.

Based on Cement by Fridrich W. Locher

IV. Answer the following questions.

1. What types of kilns are used to produce cement?
2. Why the cement had to be screened in further development?

3. What are the types of cement mills and their capacities?
4. What types of mills were used in the USA?
5. How was greater fineness achieved with reasonable throughput?

V. Match the beginnings with the endings of the following sentences.

1. A cement is a binder used in construction that	a) in the production of mortar in masonry.
2. The most important types of cement are used as a component	b) aggressive chemicals after setting.
3. Concrete is a combination of cement and an aggregate to form	c) wet conditions or underwater.
4. Cements used in construction can be characterized as being	d) a strong building material.
5. Non-hydraulic cement will not set in	e) sets and hardens and can bind other materials together.
6. Cement sets as it dries and reacts	f) due to a chemical reaction between the dry ingredients and water.
7. The design of engineering works	g) with carbon dioxide in the air.

VI. Decide whether the following statements true or false.

1. The rotary cement kiln was patented by Frederick Ransome.
2. Industrial clinker production started in the beginning of 1900.
3. The first preheater kilns were used in Germany in the 18^{th} century.
4. Jaw crushers were used for final comminution.
5. Grinding rolls were used for fine grinding.
6. Tube mill substituted all mill designs for grinding later on.

❖ **Language development**

VI. Find the correct translations to the following words.

1) throughput 2) achieve 3) come on steam 4) length 5) comminution 6) fineness 7) jaw crusher 8) conformed 9) pendulum 10) residue	a) вступати в експлуатацію; починати діяти b) продуктивність c) здрібнювання d) маятник e) узгоджений f) осад g) довжина h) досягати i) щокова дробарка j) дрібнозернистість

VIII. Match the words with their definitions.

1) crush 2) conform 3) pendulum 4) residue 5) comminution 6) achieve 7) raw 8) mill 9) tube 10) length	a) a device for grinding a solid substance to powder b) to press, mash, or squeeze so as to break c) reach or attain (a desired objective, level, or result) by effort, skill, or courage d) the action of reducing a material, especially a mineral ore, to minute particles or fragments e) a weight hung from a fixed point so that it can swing freely, especially a rod with a weight at the end that regulates the mechanism of a clock f) the measurement or extent of something from end to end; the greater of two or the greatest of three dimensions of a body g) a long, hollow cylinder of metal, plastic, glass, etc., for holding or transporting something, chiefly liquids or gases h) unprocessed, untreated, unrefined, crude, natural i) to comply in actions, behavior, etc., with accepted standards or norms j) a small amount of something that remains after the main part has gone or been taken or used

IX. Find the synonyms to the following words.

1) residue	a) breaking up
2) achieve	b) reach
3) gap	c) adapt
4) length	d) refinement
5) comminution	e) size
6) fineness	f) remainder
7) crush	g) squash
8) conform	h) space
9) grind	i) productivity
10) throughput	j) mince

X. Study these phrases and make up your sentences with them.

to go down the tube(s) — зазнати фіаско, потерпіти крах;

to add fuel to the fire — підлити масла у вогонь

to explode a theory —заперечити теорію, підірвати теорію

to confirm sombody in office — затвердити кого-н. на посаді

XI. Paraphrase these sentences using one of these idioms below:

to go down the tube(s), to add fuel to the fire, to explode a theory, to confirm somebody in office

1. Albert Einstein challenged this theory. 2. After this unlucky attempt they were completely lost or wasted. 3. Saying that she caused awful conflict in the office. 4. Being responsible and competent he was established in his position as chairman.

XII. Complete the sentences using the following words:

A. *Solid, reach, consider, fine, widely, from, coarse, firm, reaction.*

1. Cement is a _____ material in construction. 2. It consists of a very _____ powder. 3. When water is added to cement, a chemical _____ occurs, and the

cement begins to set – it starts to become _____ . 4. The most _____ used cement-based material is concrete, which is made _____ cement, fine aggregate (sand), _____ aggregate (gravel) and water. 5. After concrete has set it needs time to _____ its structural strength – the strength needed to perform effectively. 6. Generally, engineers _____ that this strength is reached after 28 days – a point called 28-day strength.

B. *Clinker, insulation, rate, entry.*

1. In this example the clinker _____ temperature is 1120°C. 2. Although radiation and convection losses are kept low by the thermal _____ provided by the refractory lining and the insulated liner plates. 3. The _____was cooled to a final exit temperature of about 170°C, without having recourse to water injection. 4. With water injection at a _____ of about 3% of the clinker throughput the final temperature was lowered another 40°, which was not attended by any increase in heat consumption.

❖ **Grammar**

XIII. Complete the following text with the correct form of the verbs in brackets.

Over the past ten years, this area (1) _____ (experience) severe flooding. Houses (2) _____ (damage) and roads (3) _____ (destroy). The local authority (4) _____ (decide) to introduce a flood control system. At present our workforce (5) _____ (build) a dam on the west die of the town and dikes along the river bank (6) _____ (heighten). We must complete the work within two months, so at present we (7) _____ (work) 24 hours a day. We (8) _____ (believe) that these measures will solve the problem in the short term but on 1st May we (9) _____ (start) work on a new watercourse. The plans (10) _____ already _____ (draw up) and we (11) _____ (be) ready to start next week.

Translation

XIV. Translate the following sentences into Ukrainian and pay attention to the translation of the new words.

1. The **pendulum** of public opinion has swung back in his favour. 2. The ink has spilt on(to) the desk. 3. Crowds from the theatre were **spilling onto** the street. 4. There's still a reasonable **throughput** of business. 5. After extensive **research**, Albert Hoffman first succeeded in **synthesizing** the acid in 1938. 6. A vitamin is a chemical compound that can be synthesized by the human body. 7. The long-distance plane has to stop at Heathrow to **fuel up**. 8. Electricity privatisation has **exploded** the myth of cheap nuclear power. 9. Such rumours have only recently been **exploded**. 10. The President **confirmed** that a conference would take place.

XV. Translate the following sentences from Ukrainian into English.

Шлам, приготований мокрим способом, є сметанообразним і має в своєму складі 35-45% води. Далі суміш подається в піч. Піч являє собою довгий, до 200 метрів, сталевий барабан, діаметром до 7 метрів, покритий зсередини вогнетривкою цеглою. Така величезна піч на добу може видавати до 3.000 тонн клінкеру. Піч встановлюється під ухилом, і з верхнього холодного кінця подається шлам, а з нижнього гарячого кінця подається паливо. Піч обертається і шлам поступово просувається до виходу, при цьому температура стає все більше і в місці горіння палива може досягати 17.000 градусів. При такій температурі відбуваються хімічні реакції і утворюється клінкер.

❖ **Listening**

XVI. Watch the video "How It's Made Concrete pipes" https://www.youtube.com/watch?v=E6jlTxhL8bg and answer the following questions.

1. What is sewer and drainage pipes made of?
2. What is used in the pipes to add strength?
3. How small and how large can be concrete pipes?

4. What is the average lifespan of a concrete pipe?
5. What is the name of the machine which forms the pipes?

❖ **Writing**

XVII. Write a report on how concrete is produced and used for building purposes (150-180 words). Consult the Appendix on page 58.

❖ **Speaking**

XVIII. Imagine that you are invited to the conference which is devoted to new methods of cement making. Prepare reports on this topic and share your ideas with the colleagues about ecologically-friendly methods of cement making process.

XIX. Imagine you are a producer of cement and present your product to the customer dwelling on all the advantages of it and the customer should ask the seller about the disadvantages of this product. Work in pairs and create a dialogue between a producer and seller. Use the following phrases in the dialogue.

- *Can I help you?*
- *Yes, please. I am interested in …*
- *What are the drawbacks/disadvantages of ….*
- *What are you going to use it for?*
- *We have a wide range of product(s) you are looking for …*
- *I guess I have a lot to learn about …*
- *The main advantage of this type of cement is…*

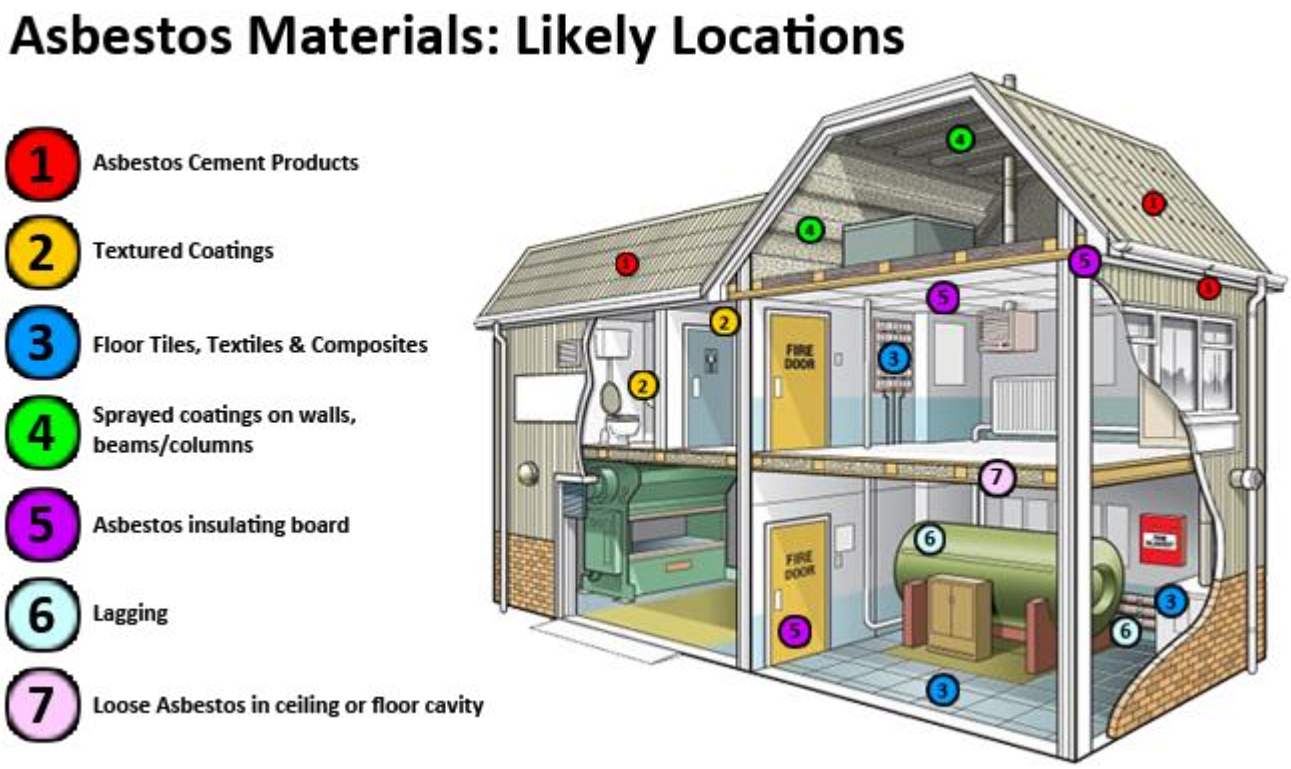
UNIT 4

ASBESTOS

❖ Lead-in

I. What images spring to mind when you hear the word asbestos? What associations do you have with asbestos? What can substitute asbestos?

II. Look at the picture and discuss in small groups all asbestos materials that can be in the house.



❖ Reading

III. Read the text and name the main historical facts mentioned in the text and translate the words which are in bold.

ASBESTOS

Asbestos (pronounced /æsˈbɛstəs/ or /æzˈbɛstəs/ is a set of six naturally occurring silicate minerals which all have in common their eponymous asbestiform habit: long (roughly 1:20 aspect ratio), thin fibrous crystals, with each **visible** fiber composed of millions of microscopic "fibrils" that can be released by **abrasion** and other processes. They are commonly known by their colors, as blue asbestos, brown asbestos, white asbestos, and green asbestos.

Asbestos mining existed more than 4,000 years ago, but large-scale mining began at the end of the 19th century, when manufacturers and builders began using asbestos because of its desirable physical properties: sound absorption, average tensile strength, its resistance to fire, heat, electrical and chemical damage, and affordability. It was used in such applications as electrical insulation for hotplate wiring and in building **insulation**. When asbestos is used for its resistance to fire or heat, the fibers are often mixed with cement or woven into fabric or mats. These **desirable** properties made asbestos a very widely used material, and its use continued to grow throughout most of the 20th century until the knowledge of carcinogenic effects of asbestos dust caused its effective demise as a **mainstream** construction and fireproofing material in most countries.

It is now known that prolonged **inhalation** of asbestos fibers can cause serious and fatal illnesses including lung cancer, mesothelioma, and asbestosis (a type of pneumoconiosis). Health issues related to asbestos exposure can be found in records dating back to Roman times. By the beginning of the 20th century concerns were beginning to be raised, which escalated in severity during the 1920s and 1930s. By the 1980s and 1990s asbestos trade and use started to become banned outright, phased out, or heavily restricted in an increasing number of countries.

The severity of asbestos-related diseases, the material's extremely **widespread** use in many areas of life, its continuing **long-term** use after harmful health effects were known or suspected, and fact that asbestos-related diseases can emerge decades after exposure ceases, have resulted in asbestos litigation becoming the longest, most expensive mass tort in U.S. history and a much lesser legal issue in most other countries involved. Asbestos-related **liability** also **remains** an **ongoing concern** for many manufacturers, insurers and reinsurers.

Early uses. Asbestos use in human culture dates back at least 4,500 years, when evidence shows that inhabitants of the Lake Juojärvi region in East Finland strengthened earthenware pots and cooking utensils with the asbestos mineral anthophyllite. The word asbestos comes from the ancient Greek ἄσβεστος, meaning "unquenchable" or "inextinguishable". One of the first descriptions of a material that

may have been asbestos is in Theophrastus, On Stones, from around 300 BC, although this identification has been questioned. In both modern and ancient Greek, the usual name for the material known in English as "asbestos" is amiantos ("undefiled", "pure") whence the term for it in, e.g., French amiante and Portuguese amianto. In modern Greek, the word ἀσβεστος or ασβέστης stands consistently and solely for lime.

Wealthy Persians amazed guests by cleaning a cloth by exposing it to fire. For example, according to Tabari, one of the curious items belonging to Khosrow II Parviz, the great Sassanian king (531–579), was a napkin that he cleaned simply by throwing it into fire. Such cloth is believed to have been made of asbestos imported over the Hindu Kush. Charlemagne, the first Holy Roman Emperor (800–814), is said to have had a tablecloth made of asbestos. Some archeologists believe that ancients made shrouds of asbestos, wherein they burned the bodies of their kings, in order to preserve only their ashes, and prevent them being mixed with those of wood or other combustible materials commonly used in funeral pyres. Others assert that the ancients used asbestos to make perpetual **wicks** for sepulchral or other lamps. In more recent centuries, asbestos was indeed used for this purpose. Although asbestos causes skin to itch upon contact, ancient literature indicates that it was prescribed for diseases of the skin, and particularly for the itch. It is possible that they used the term asbestos for soapstone, because the two terms have often been confused throughout history.

Industrial era. Industrial scale asbestos mining began in 1878 in Thetford township, Quebec. By 1895, mining was increasingly mechanized. The large scale asbestos industry began in the mid-19th century. Early attempts at producing asbestos paper and cloth in Italy began in the 1850s, but were unsuccessful in creating a market for such products. Canadian **samples** of asbestos were displayed in London in 1862, and the first companies were formed in England and Scotland to exploit this resource. Asbestos was first used in the manufacture of yarn, and German industrialist Louis Wertheim adopted this process in his factories in Germany. In 1871, the Patent Asbestos Manufacturing Company was established in

Glasgow, and within the following decades, the Clydebank area became a centre for the **nascent** industry.

Industrial scale mining began in the Thetford hills, Quebec from the 1870s. Sir William Edmond Logan was the first to notice the large deposits of chrysotile in the hills in his **capacity** as head of Geological Survey of Canada. Samples of the minerals from here were displayed in London, and **excited** much interest. With the opening up of the Quebec Central Railway in 1876, mining entrepreneurs, such as Andrew Stuart Johnson established the asbestos industry in the province. The 50 ton output of the mines in 1878 rose to over 10,000 tons in the 1890s with the adoption of machine technologies and expanded production. The world's largest asbestos mine was the Jeffrey mine in the town of Asbestos, Quebec.

The applications of asbestos multiplied at the end of the 19th century. This is an advertisement for an asbestos-lined clothes iron from 1906. Asbestos production began in the Urals of the Russian Empire in the 1880s, and in the Alpine regions of Northern Italy with the formation in Turin of the Italo-English Pure Asbestos Company in 1876, although this was soon **swamped** by the greater production levels from the Canadian mines. Mining also took off in South Africa from 1893 under the aegis of the British businessman Francis Oates, the Director of the De Beers company. It was in South Africa that the production of **amosite** began in 1910. The U.S. asbestos industry had an early start in 1858, when fibrous anthophyllite was mined for use as asbestos insulation by the Johns Company, a **predecessor** to the current Johns Manville, at a quarry at Ward's Hill on Staten Island, New York. US production began in earnest in 1899, with the discovery of large deposits in the Belvidere Mountain. The use of asbestos became increasingly widespread towards the end of the 19th century, when its **diverse applications** included fire retardant coatings, concrete, bricks, pipes and fireplace cement, heat, fire, and acid resistant gaskets, pipe insulation, ceiling insulation, fireproof drywall, flooring, roofing, lawn furniture, and drywall joint compound. In 2011 it was reported that over 50% of UK houses still contained asbestos, despite a ban on asbestos products some years earlier.

In Japan, particularly after World War II, asbestos was used in the manufacture of ammonium sulfate for purposes of rice production, sprayed upon the ceilings, iron skeletons, and walls of railroad cars and buildings (during the 1960s), and used for energy efficiency reasons as well. Production of asbestos in Japan peaked in 1974 and went through ups and downs until about 1990, when production began to drop **dramatically.**

Based on https://en.wikipedia.org/wiki/Asbestos

IV. Answer the following questions.

1. What is asbestos?
2. How long does asbestos mining exist?
3. When did the applications of asbestos multiply?
4. When did asbestos production begin in the Russian Empire?
5. When did the use of asbestos become increasingly widespread?

V. Match the beginnings with the endings of the following sentences.

1. The word "cement" can be traced back	a) supplements that were added to the burnt lime.
2. It was made from crushed rock with	b) the lime cycle.
3. The volcanic ash and pulverized brick	c) to the Roman term, used to describe masonry resembling modern concrete.
4. This reaction takes a significant amount of time because the partial	d) for this reason the slaked lime is a non-hydraulic cement and cannot be used under water.
5. The carbonation reaction requires the dry cement to be exposed to air, and	e) pressure of carbon dioxide in the air is low.
6. This whole process is called	f) essential to allow the formation of the liquid phase during the kiln firing.
7. The silicates are responsible of the mechanical properties of the cement and are	g) object of research.
8. The chemistry of the reactions is not completely clear and is still the	h) burnt lime as binder.

❖ **Language development**

VI. Find the correct translations to the following words.

1. occur	a) основний
2. long-term	b) траплятися
3. large-scale	c) великомасштабний
4. widespread	d) попередник
5. predecessor	e) безперервний
6. inhalation	f) занепокоєння
7. concern	g) вдихання
8. ongoing	h) поширений
9. mainstream	i) довгостроковий
10. abrasion	j) тертя, стирання

VII. Find the synonyms to the following words.

1. spray	a) durable
2. abrasion	b) happen; take place
3. long-term	c) relate to; be about
4. large-scale	d) continuing
5. dramatically	e) brightly
6. widespread	f) sprinkle
7. occur	g) output
8. concern	h) scraping
9. production	i) massive
10. ongoing	j) broad

VIII. Choose the words which relate to cement making and make up your sentences with them: *dye, distil, crack, condense, collector, grain, asphalt, explosive, explode, draw, roll, mill, heat, impurity, crash, crasher, fertilizer, fuel, paint, lubrication, lubricate, soap, spill, store, synthesize, disposable, recycle, bowl, blow, truck, transport.*

IX. Match the following words with their definition.

1. large-scale	a) stimulate;
2. excite	b) found and distributed over a large area;
3. occur	c) continuing; still in progress;
4. widespread	d) happen; take place;
5. concern	e) stretch; become or make larger or more extensive;
6. ongoing	f) relate to;
7. expand	g) extensive;
8. silicate	h) a salt in which the anion contains both silicon and oxygen;
9.insulation	
10.abrasion	i) the process of scraping or wearing something away;
	j) a thick layer of a substance that keeps something warm, especially a building;

X. Fill in the gaps the following words: *operations, effectiveness, productivity, controlling, processes, planning, factories, contribute, inputs, outputs, manufacturing, flow, raw material, produce, success.*

Production management is concerned with (1) _____ and (2) _____ industrial (3) _____ which (4) _____ and (5)_____ products and services. Techniques of production management are also used in service industries; here they are called (6) _____ management. During production processes, (7) _____ are converted into (8) _____. These processes take many forms: from basic agriculture to large-scale (9) _____. Much manufacturing takes place in (10) _____, where assembly lines allow a steady (11) _____ of (12) _____ (inputs) and finished products (outputs).

People in production focus on efficiency and processes in order to maximize (13) _____. To achieve overall (14) _____ , it is important to measure, analyze and evaluate these processes. However, other activities also (15) _____ to success: purchasing, inventory control, quality control, storage, logistics.

XI. Find the opposites to the following words.

1. assemble	a) suppress
2. excite	b) rare
3. large-scale	c) unclear
4. widespread	d) small
5. concern	e) indifference
6. visible	f) dimly
7. dramatically	g) unimportant
8. activity	h) inertness
9. combustible	i) non-inflammable
10.essential	j) dismantle

XII. Fill in the appropriate word(s) from the list below to make phrases from the text. Use the following words only once: *materials, known, illnesses, properties, asbestos, concern, something in common, manufacturers.*

1. it is a matter of great …..
2. these desirable …..
3. widely used …..
4. they are commonly …..
5. minerals which all have …..
6. it can cause serious …..
7. prolonged inhalation of …..
8. it remains an ongoing concern for ….

❖ **Grammar**

XIII. Make past tense questions and answers using the words given.

e.g: When were fiber optics first developed?- Fiber optics were developed in XXth century.

1. When / be /fibre optics/ first/ develop?
2. The boxes/ break / because they / make / of low quality materials.
3. The power supply / cut off / because / cables / come down / during the storm.
5. They / not complete / the foundations / by the time the building materials / arrive/

6. When / they / install / the solar panels?
7. be / this / the first hydroelectric scheme / in Scotland?
8. They / not use / wood chip / for heating / when the engineer / visit / the factory.
9. How / they / produce / gas / before they / discover / North Sea gas?
10. be / the oil pollution along the coastline / cause / by an oil tanker spillage?
11. How / they prepare access to this mine?

❖ **Translation**

XIV. Translate the following sentences into Ukrainian.

1. There is an **ongoing** debate on the issue. 2. That research is **ongoing**. 3. A fifth year of drought is expected to have **dramatic** effects on the California economy. 4. This policy has led to a **dramatic** increase in our prison populations. 5. The move follows growing public **concern** over the spread of the disease. 6. As the militants gather, there is **concern** that the protest might again run out of control. 7. Students learned the practical **application** of the theory they had learned in the classroom. 8. Simon's book provides an outline of artificial intelligence and its **application** to robotics. 9. Albert Jones' new style will **inevitably** put him in touch with a much more diverse and perhaps younger audience. 10. This was the company's first step into the **mainstream** of scientific and commercial computing.

XV. Translate the following sentences from Ukrainian into English.

Технологія виробництва цементу сухим способом в принципі схоже з технологією виробництва мокрим способом. Головним чином розглянемо відмінності, а помел цементу, підготовка добавок, зберігання цементу — все аналогічно. Після дроблення вапняку та глини їх висушують до 1% вологості і перемелюють в сировинну борошно. Для сушіння сировини використовуються або сушильні барабани (при роздільній сушінні), або спеціальні млини (при одночасній сушінні), де обидва компоненти

перемелюють і при цьому сушаться. Останній спосіб застосовується на більшості заводів т.к. є найбільш ефективним.

❖ **Listening**

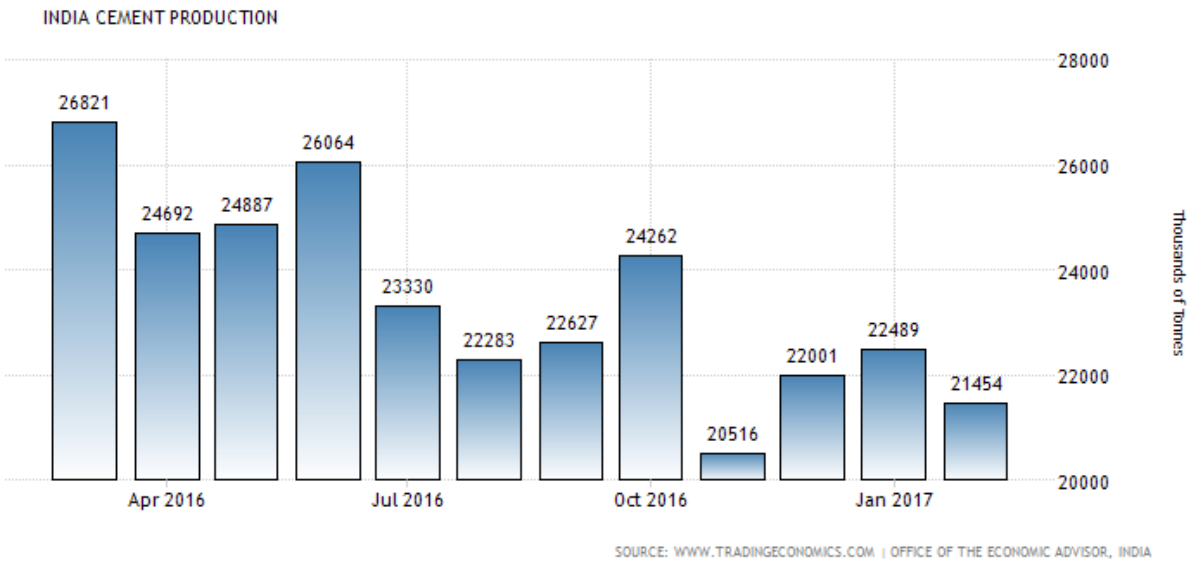
XVI. Watch the video https://www.youtube.com/watch?v=bvvXCIlX8OU "Asbestos" and answer the following questions.

1. What are the basic characteristics of asbestos?
2. Where was asbestos used in?
3. When were the first commercial asbestos mines opened in Quebec?
4. Why did asbestos manufacturers file a lawsuit against the federal government?
5. Can asbestos be dangerous?
6. What was the biggest asbestos manufacturer in the USA in the 20th century?

❖ **Writing**

XVII. Study the graph below and describe the changes in cement production in India from April 2016 to January 2017. Use the following phrases below in your description (100-150 words). Consult the Appendix on page 58.

Cement Production in India decreased to …, cement production in India averaged ….., reaching an all-time high of 2681, a record low of … thousands of tones in ….



❖ **Speaking**

XVIII. Study the picture of portland cement manufacturing steps on page 44, and continue the description given.

There are the following steps of Portland cement manufacturing…

Raw materials consist of …

It is primarily crushed …

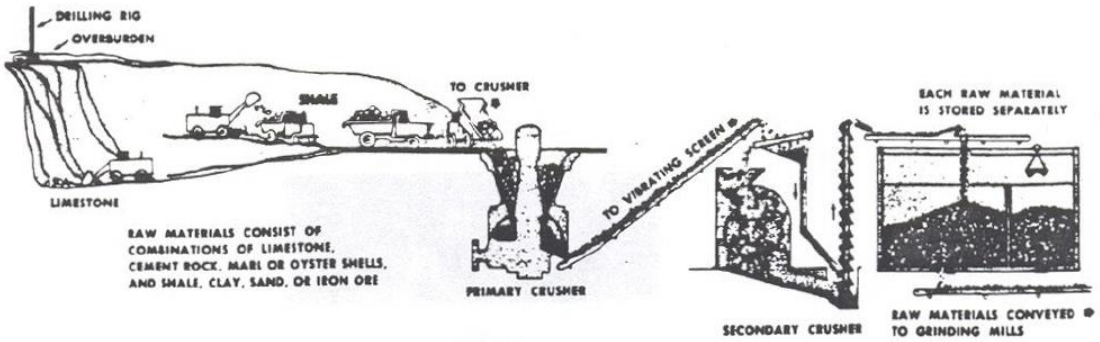
Raw materials are ground and blended …

Cement goes into grinding mill…

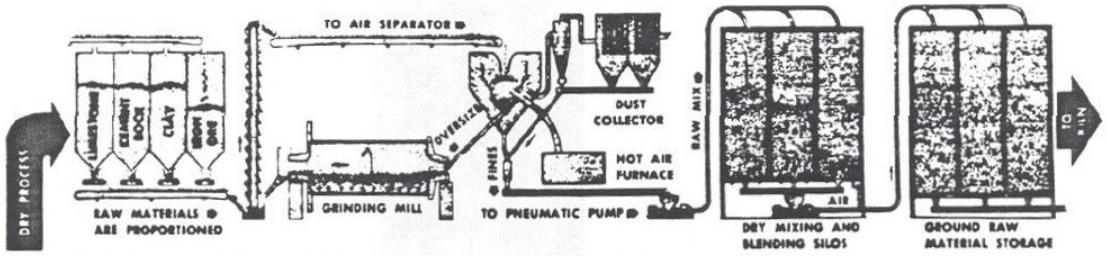
Ready product is stored in … and shipped…

XIX. Imagine your firm wants to buy cement for construction of a new plant and roads. Work in pairs and create a dialogue between a customer and suppliers of cement.

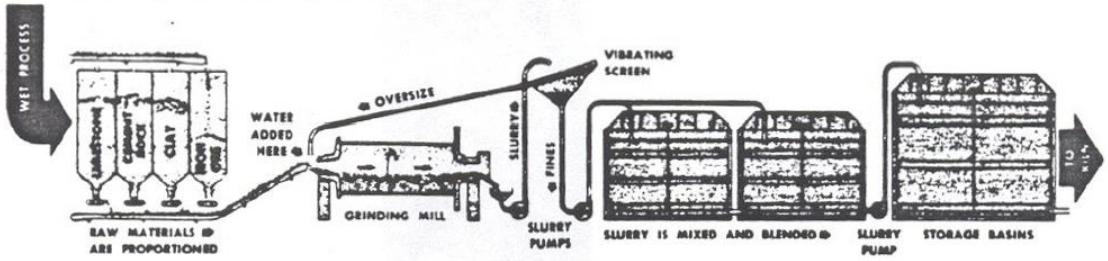
Steps in the manufacture of portland cement



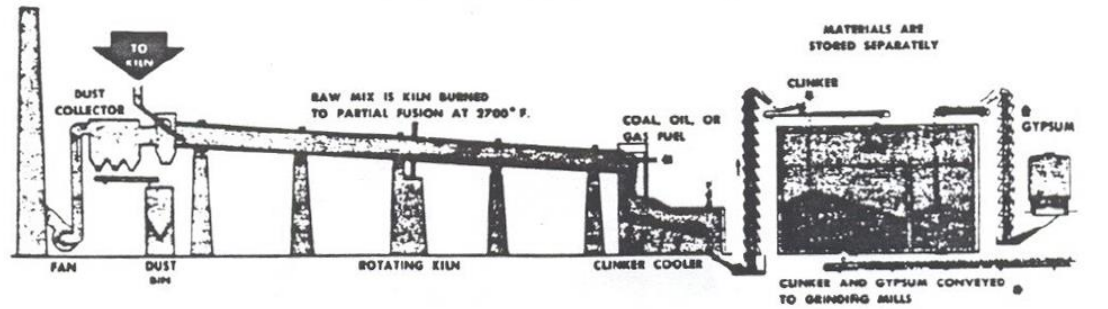
1. Stone is first reduced to 5-in. size, then to ¾ in., and stored.



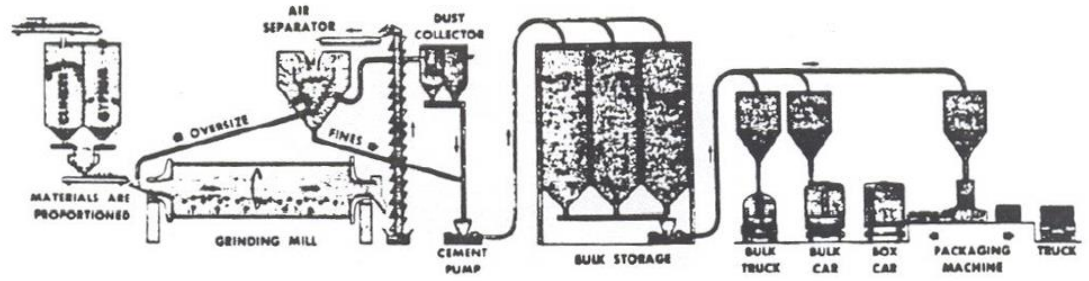
OR 2. Raw materials are ground to powder and blended.



2. Raw materials are ground, mixed with water to form slurry, and blended.



3. Burning changes raw mix chemically into cement clinker.



4. Clinker with gypsum is ground into portland cement and shipped.

UNIT 5

BUILDING METERIALS

Lead-in

I. Think of as many words as possible related to the theme "dwelling" and the materials which they are made of and compile the list of them with your partner. What materials did people use for building in ancient times? What materials are used in construction nowadays?

II. Look at the pictures and describe the building materials which were used for construction of such houses.

❖ **Reading**

III. Read the text, name all the mentioned building materials and translate the words which are in bold.

BUILDING METERIALS

Building material is any material which is used for a construction purpose. Many naturally occurring substances, such as clay, sand, wood and rocks, even **twigs** and leaves have been used to construct buildings. Apart from naturally occurring materials, many man-made products are in use, some more and some less synthetic. The manufacture of building materials is an established industry in many countries and the use of these materials is typically segmented into specific specialty trades, such as **carpentry, plumbing, roofing** and insulation work. This reference deals with habitats and structures including homes.

Natural materials. Building materials can be generally categorized into two sources, natural and synthetic. Natural building materials are those that are unprocessed or minimally processed by industry, such as lumber or glass. Synthetic materials are made in industrial settings after much human manipulations, such as plastics and petroleum based paints. Both have their uses. Mud, stone, and fibrous plants are the most basic building materials, aside from tents made of flexible materials such as cloth or skins. People all over the world have used these three materials together to create homes **to suit** their local weather conditions. In general stone and brush are used as basic structural components in these buildings, while **mud** is used to fill in the space between, acting as a type of concrete and insulation.

Fabric. The tent used to be the home of choice among nomadic groups the world over. Two well-known types include the conical **teepee** and the **circular yurt**. It has been revived as a major construction technique with the development of tensile architecture and synthetic fabrics. Modern buildings can be made of flexible material such as fabric membranes, and supported by a system of steel cables or internal (air pressure.)

Mud and clay. The amount of each material used leads to different styles of buildings. The deciding factor is usually connected with the quality of the soil being used. Larger amounts of clay usually mean using the cob/adobe style, while low clay soil is usually associated with sod building. The other main ingredients include more or less sand/gravel and straw/grasses. Clay holds heat or cold, releasing it over a period of time like stone. Earthen walls change temperature slowly, so artificially raising or lowering the temperature can use more resources than in a wood built house, but the heat/coolness stays longer. Some of these buildings have remained **habitable** for hundreds of years.

Rock. Rock structures have existed for as long as history can recall. It is the longest lasting building material available, and is usually readily available. There are many types of rock through out the world all with differing attributes that make them better or worse for particular uses. Rock is a very dense material so it gives a lot of protection too, its main draw-back as a material is its weight and

awkwardness. Its energy density is also considered a big drawback, as stone is hard to keep warm without using large amounts of heating resources. Dry-stone walls have been built for as long as humans have put one stone on top of another. Eventually different forms of mortar were used to hold the stones together, cement being the most commonplace now. Mostly stone buildings can be seen in most major cities, some civilizations built entirely with stone such as the Pyramids in Egypt, the Aztec pyramids and the remains of the Inca civilization.

Thatch. Thatch is one of the oldest of building materials known; grass is a good insulator and easily harvested. Many African tribes have lived in homes made completely of grasses year round. In Europe, thatch roofs on homes were once prevalent but the material fell out of favour as industrialization and improved transport increased the availability of other materials. Today, though, the practice is undergoing a **revival**. In the Netherlands, for instance, many of new builds too have thatched roofs with special ridge tiles on top.

Brush. Brush structures are built entirely from plant parts and are generally found in tropical and sub-tropical areas, such as rainforests, where very large leaves can be used in the building. Native Americans often built brush structures for resting and living in, too. These are built mostly with branches, twigs and leaves, and bark, similar to a beaver's lodge.

Ice. Ice was used by the Inuit for igloos, but has also been used for ice hotels as a tourist attraction in northern areas that might not otherwise see many winter tourists.

Wood. Wood is a product of trees, and sometimes other fibrous plants, used for construction purposes when cut or pressed into **lumber** and **timber**, such as boards, planks and similar materials. It is a generic building material and is used in building just about any type of structure in most climates. Wood can be very flexible under loads, keeping strength while bending, and is incredibly strong when compressed vertically. Historically, wood for building large structures was used in its unprocessed form as logs. The trees were just cut to the needed length, sometimes stripped of **bark**, and then notched or lashed into place.

Brick and Block. A brick is a block made of kiln-fired material, usually clay or shale, but also may be of lower quality mud, etc. Clay bricks are formed in a moulding (the soft mud method), or in commercial manufacture more frequently by extruding clay through a die and then wire-cutting them to the proper size (the stiff mud process). Bricks were widely used as a building material in the 1700, 1800 and 1900s.

Concrete. Concrete is a composite building material made from the combination of aggregate (composite) and a binder such as cement. The most common form of concrete is Portland cement concrete, which consists of mineral aggregate (generally gravel and sand), portland cement and water. After mixing, the cement hydrates and eventually hardens into a stone-like material. This strengthened concrete is then referred to as reinforced concrete. In order to minimize any air bubbles that would weaken the structure, a vibrator is used to **eliminate** any air that has been entrained when the liquid concrete mix is poured around the ironwork.

Metal. Metal is used as structural framework for larger buildings such as skyscrapers, or as an external surface covering. There are many types of metals used for building. Steel is a metal alloy whose major component is iron, and is the usual choice for metal structural building materials.

Cement composites. Cement bonded composites are an important class of building materials. These products are made of hydrated cement paste that binds wood or alike particles or fibers to make pre-cast building components. Various fiberous materials including paper and fiberglass have been used as binders. Wood-cement compatibility is the ratio of a parameter related to the property of a wood-cement composite to that of a neat cement paste.

http://theconstructor.org/building/buildings/building-materials/699/

IV. Discuss the following questions with your partner.

1. What are the main building materials?
2. What substances were used as building materials in the ancient times?
3. What was used as building materials for roofs long ago?
4. What materials are used for architectural hardware nowadays?

5. What are the cement bonded composites?

V. Match the beginnings with the endings of the following sentences.

1. The term cement is commonly used to refer to powdered materials which 2. These materials are more properly 3. Gypsum plaster, common lime, hydraulic limes, natural pozzolana, and portland 4. Cement was first invented by the 5. Cement was later reinvented by the Greeks and the Babylonians 6. The Romans produced cement from pozzolana, an ash 7. Cement is a fine grayish powder which, when mixed with 8. When this paste is mixed with sand and gravel and allowed to	a) cements are the more common hydraulic cements, with Portland cement being the most important in construction. b) develop strong adhesive qualities when combined with water. c) who made their mortar out of lime. d) Egyptians. e) water, forms a thick paste. f) dry it is called concrete. g) found in all of the volcanic areas of Italy, by mixing the ash with lime. h) known as hydraulic cements.

❖ **Language development**

VI. Find the correct translations to the following words.

1. circular 2. plumbing 3. habitable 4. roofing 5. compatibility 6. eliminate 7. lumber 8. timber 9. bark 10. thatch	a) водопровід b) покрівля c) сумісність d) ліквідувати e) пиломатеріали f) лісоматеріали g) кора h) солома i) заселений j) круговий

VII. Choose the proper word to fill in the gaps in the following sentences: *silica, stone, pulverized, mixture, slowly, product, required, cylinder, end, kiln, purified, raw, introduced, steel, provides, cooled, mixed, two.*

1. The raw materials _____for cement manufacture are lime stone which _____ calcium. 2. Clay which provides aluminium and _____. 3. Cement is manufactured by _____ methods, they are: wet process and dry process. 4. In the wet process, first the clay is _____ by washing in a wash mill. 5. The lime _____ is crushed into small particles and mixed with purified clay in proper proportions to get raw slurry. 6. In the dry process the raw materials are _____ in proper proportions. 7. The mixture is dried, _____ and made uniform. The resulting powder is called "raw material". 8. The raw slurry or _____ meal, obtained by one of wet or dry process called charge. 9. Charge is _____ into a rotary kiln. 10. The rotary kiln consists of a _____ cylinder about 150 meters long and 4 meter diameter and rotates 30 to 60 turns per hour. 11. At one end of the _____ a screw conveyer is arranged which slowly allows the charge into the cylinder. 12. The other _____ of the cylinder, coal or burning oil is burnt at this end. 13. The charge entering the cylinder _____ moves towards the hot end. 14. At the burning end of the_____ , the temperature is around 1700 to 1900degrees centigrade, at this end some chemical reactions take place between calcium oxide and aluminium silicates. 15. _____ of calcium silicates and calcium aluminates is formed. 16. The resultant _____ consists of gray hard balls called clinker cement. 17. Clinker cement is_____ , ground to fine powder and mixed with 2 to 3 percent of gypsum.

VIII. Match the terms with their definitions.

1. roofing	a) suitable or good enough to live in;
2. plumbing	b) a state in which two things are able to exist;
3. compatibility	c) the system of pipes;
4. eliminate	d) the structure forming the upper covering of a building or vehicle;
5. lumber	e) to remove it completely;
6. timber	f) large pieces of wood;
7. bark	g) wood that is used for building houses and making furniture;
8. thatch	h) material that covers the outside of a tree;
9. habitable	i) a roof covering of straw, reeds, palm leaves, or a similar material;
10. circular	j) having the form of a circle;

IX. Fill in the appropriate word(s) from the list below to make phrases from the text. Use the following words only once: *conditions, habitable, level, insulator, sources, industry, materials, cloth.*

1. categorized into two ….
2. processed by …..
3. basic building …..
4. flexible material such as …
5. buildings remained …..
6. to suit weather …..
7. keep temperatures at a constant…
8. grass is a good …..

X. Learn the following idioms with the word water and translate the sentences below into Ukrainian.

in hot water/ in deep water — в біді (зі своєї вини);
to get into hot water — потрапити в біду; заплутатися, "влипнути";
to keep one's head above water — триматися на поверхні; не зазнавати труднощів;
come hell or high water — не дивлячись ні на що;
like water off a duck's back — як з гуски вода;
to water down one's remarks — пом'якшувати (свої) зауваження.

1. A number of customers have taken legal action against our company – we're really **in deep water** now. 2. I am going to run a marathon this year, **come hell or high water**! 3. Jason borrowed his dad's watch and then lost it – he's gonna be **in hot** water when his father finds out! 4. My boss gives me so much to do that I have to work weekends just to **keep my head above water**. 5. Ten years from now, all the little problems you're having today will just be **water under the bridge**. 6. Before I decided to become a full-time photographer, I **tested the waters** by doing a few projects to see if I'd enjoy the work. 7. Water down your remarks, you can upset people!

XI. Make up seven sentences with the idioms from Exercise X.

XII. Find the synonyms to the following words.

1. revival	a) suitable to live
2. suit	b) cloth
3. mud	c) stretchy
4. habitable	d) premises
5. fabric	e) slush
6. housing	f) fit
7. timber	g) renewal
8. insular	h) wood
9. flexible	i) adaptable
10. elastic	j) closed

❖ **Grammar**

XIII. Put the verbs in brackets in the passive voice.

Recyclable materials _____ (recover) from municipal refuse by a number of methods, including shredding (cutting and tearing things into long, thin strips), separating metals with a large magnet, screening and squashing. Another method of recovery is the wet pulping process, incoming refuse _____ (mix) water and _____(ground) into a pulp in a machine called the wet pulper, which resembles a large kitchen disposal unit. Large pieces of metal _____(pull) out by a magnetic device before everything from the pulper _____(load) into a cetriguge called a liquid cyclone. Here the heavier materials which cannot be burnt, such as glass, metals and ceramics, _____(separate) out and _____(send) on to a glass and metal-recovery system. Other, lighter materials go to a paper-fiber-recovery system. The final residue _____either (burn) or _____(use) as landfill.

❖ **Translation**

XIV. Translate the following sentences into Ukrainian and pay attention to the translation of the new words.

1. If a place is **habitable**, it is good enough for people to live in. 2. National courts can freeze any law while its **compatibility** with European Community legislation is being tested. 3. The **timbers** of a ship or house are the large pieces of wood that have been used to build it. 4. There is little chance of a **revival** in new car sales until at least August next year. 5. She learned to wire and **plumb t**he house herself. 6. A gust of wind pried loose a section of sheet-metal **roofing**. 7. Stone began to be used as a **roofing** material. 8. The plane **circled**, awaiting permission to land. 9. There were two helicopters **circling** around. 10. **Thatch** is naturally warm in winter and cool in summer.

XV. Translate the following sentences from Ukrainian into English.

Мокрий спосіб найбільш оптимальний, якщо для створення цементу застосовується два м'яких матеріалу, адже подрібнити їх можна банально розмішавши у воді. Сухий спосіб застосовується, коли вологість сировини не перевищує 10%. Якщо вихідний матеріал досить пластичний — перевагу можна віддати напівсухий технології виробництва цементу, адже в такому випадку виходять міцні гранули. Раніше був найбільш поширений мокрий спосіб виробництва цементу, але останнім часом все більш і більш популярним стає сухий спосіб.

❖ **Listening**

XVI. Watch the video "How It's Made Bricks" https://www.youtube.com/watch?v=SbKvhHzn4hQ **and answer the following questions.**

1. What is extrusion machine used for?
2. What is slog?
3. How long are bricks kept in a dryer?
4. What is the temperature in the kiln?
5. What does a technician do to check quality of bricks?

❖ **Writing**

XVII. Study the graph about production of cement in the countries of the world and describe it. Use the adverbs from the table below (100-150 words). Consult Unit 1 Ex. XVII and Appendix on page 58.

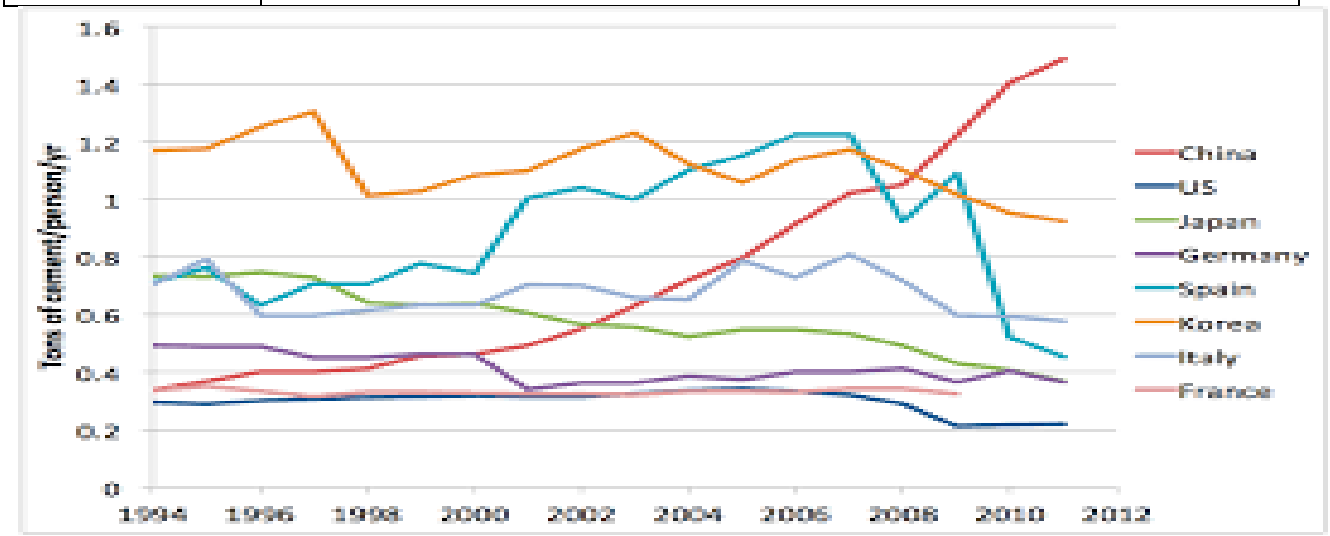
Adverbs you can use with these words are:

increased	dramatically, significantly, considerably, rapidly, substantially, steadily, sharply, markedly, greatly, slightly, exponentially, proportionally, strongly

Grew	rapidly, steadily, slowly, gradually, dramatically, substantially, enormously, quickly

Rose	sharply, slowly, steadily, slightly, rapidly, quickly, dramatically, significantly, substantially, gently, fractionally, considerably, gradually

went up	The above adverbs are not usually used with "went up".



❖ **Speaking**

XVIII. Speak about different types of dwellings which people used in ancient times and use nowadays. Discuss the construction materials that were used before and which are used in modern construction.

XIX. Work in pairs and make up a dialogue between a customer and supplier at the market of building materials. Dwell on characteristics of every material and what factors influence people's choice.

GLOSSARY

Word	Definition
abrasion	the process of scraping or wearing something away
affect	influence or make a difference to
aggregate	a whole formed by combining several separate elements
artificial	made or produced by human beings
aqueduct	a bridge carrying a waterway over a valley or other gap
bark	upper surface of a tree stem
bind	to fasten, to tie up
burn	to flame, to shine
bond	connection
compatibility	a state in which two things are able to exist
comminution	action of reducing a material, especially a mineral ore
concern	relate to; be about
concrete	a substance used for building which is made by mixing together cement, sand, small stones, and water
construction	the action of building something, typically a large structure
dramatically	greatly
durability	the ability to withstand wear, pressure, or damage
eliminate	completely remove or get rid of (something)
extract	remove or take out
favour	approval, support, or liking for someone or something
fiber	a thread from which a tissue, mineral substance is formed
foam	a mass of small bubbles that are formed when air and a liquid are mixed together
grind	reduce (something) to small particles or powder by crushing it
habitable	good enough for people to live in
harden	become stiff or firm.
key point	the main point, the main thing
kiln	a furnace or oven for burning

large-scale	huge, big, massive
long-term	durable
lumber	timber, wood materials
mainstream	the ideas, attitudes, or activities that are shared by most people and regarded as normal or conventional
mill	a building equipped with machinery for grinding grain into flour
mix	confuse
mortar	a mixture of lime with cement, sand, and water, used in building
occur	take place, happen
ongoing	continuing; still in progress
plumbing	putting in all the pipes for carrying water.
production	manufacture , making
quantity	the amount or number of a material or abstract thing
quarry	place from which stone or other materials are extracted
rapid	fast, quick
require	need for a particular purpose
resiliency	the ability of a substance or object to spring back into shape
revival	an improvement in the condition, strength
roofing	the structure forming the upper covering of a building or vehicle
sinter	make (a powdered material) into a solid mass by heating
stability	firmness, steadfastness
strength	the quality or state of being physically strong
sufficient	enough; adequate
thatch	covering of straw, reeds, palm leaves
timber	wood prepared for use in building and carpentry
widespread	found or distributed over a large area or number of people

APPENDIX

How to write a report:

To keep your report organized and easy to understand, there is a certain format to follow. The main sections of a standard report are:

Title Section: If the report is short, the front cover can include any information that you feel is necessary including the author(s) and the date prepared.

Summary: The summary consists of the major points, conclusions, and recommendations. It needs to be short as it is a general overview of the report. Some people will read the summary and only skim the report, so make sure you include all of the relevant information. It would be best to write this when the report is finished so you will include everything, even points that might be added at the last minute.

Introduction: The first page of the report needs to have an introduction. Here you will explain the problem and inform the reader why the report is being made. You need to give a definition of terms if you did not include these in the title section, and explain how the details of the report are arranged.

Body: This is the main section of the report. The previous sections needed to be written in plain English, but this section can include technical terms or jargon from your industry. There should be several sections, each clearly labeled with a subtitle. Information in a report is usually arranged in order of importance with the most important information coming first.

Conclusion: This is where everything comes together. Keep this section free of jargon as many people will just read the summary and conclusion.

Recommendations: This is where you discuss any actions that need to be taken. In plain English, explain your recommendations, putting them in order of priority.

Appendices: This includes information that the experts in the field will read. It has all the technical details that support your conclusions.

LINKING WORDS FOR DESCRIBING GRAPHS

Additional information: *additionally, furthermore, moreover, also, as well as.*

Giving example: *in other words, namely, such as, one clear example is.*

Consequences: *as a result, therefore, thus, so, hence, for this reason.*

Stressing: *particularly, especially, obviously, clearly.*

Contrasts: *admittedly, however, nevertheless, even though, but, despite, still, in comparison.*

Causes: *in my opinion, to my mind, I think, I consider.*

To sum up: *overall, in conclusion.*

AUDIOSCRIPTS

Unit 1. **(*published July, 31 201)***

MANUFACURE OF PORTLAND CEMENT

Raw Materials: The raw materials required for cement manufacture are. Lime stone which provides calcium. Clay which provides aluminium and silica. Cement is manufactured by two methods they are. Wet process. Dry process. Now let us discuss wet process and dry process detailed. WET PROCESS: In the wet process, first the clay is purified by washing in a wash mill. The lime stone is crushed into small particles and mixed with purified clay in proper proportions to get raw slurry. DRY PROCESS: In the dry process the raw materials are mixed in proper proportions. The mixture is dried, pulverized (Crushed into fine particles) and made uniform. The resulting powder is called "raw material". The raw slurry or raw meal, obtained by one of wet or dry process called charge. Charge is introduced into a rotary Kiln. The rotary kiln consists of a steel cylinder about 150meters long and 4meter diameter and rotates 30 to 60 turns per hour. At one end of the cylinder a screw conveyer is arranged which slowly allows the charge into the cylinder. The other end of the cylinder, a burneris arranged coal or burning oil is burnt at this end. The charge entering the cylinder slowly moves towards the hot end. At the burning end of the kiln, the temperature is around 1700 to 1900degrees centigrade, at this end some chemical reactions takes place between calcium oxide and aluminium silicates. Mixture of calcium silicates and calcium aluminates is formed. The resultant product consists of gray hard balls called clinker cement. Clinker cement is cooled, ground to fine powder and mixed with 2 to 3 percent of gypsum.

Unit 2 April, 23, 2016 Cement, how it is made.

The process of mining involves blasting of limestone and clay from rock quarries by boring and setting explosive the technology used in this process is modern and efficient. Once the huge rocks have been fragmented they are transported to the plant in dump trucks or by conveyor belt the quarry stone is then delivered through chutes to the crusher where it is reduced to small chunks by crushing or pounding. The proportional mix of different types of clay limestone or any other required material is known as pre homogenization. Each of the raw materials is separated and kept in silos where it will later be added in specific amounts according to the particular type of cement being produced. Raw material milling takes place in vertical steel mill which grinds the material through the pressure exerted by three conical rollers horizontal Mills inside which the material is pulverized by means of steel balls are also used in this phase raw meal homogenization action takes place in silos equipped for obtaining a homogenous mix of the material in calcination huge rotary kilns come into play inside at 1,400 degrees Celsius the raw material is transformed into

clinker small dark grey nodules three to four centimeters in diameter the clinker is grinded by different sized steel balls while it works its way through the mills to chambers with gypsum being added to extend cement setting times the cement is then housed in storage silos from where it is hydraulically or mechanically extracted and transported to facilities where it will be packaged in sacks or supplied in bulk in either case it can be shipped by rail car freighter truck or ship.

Unit 3 Published October, 6, 2009

How It's Made Concrete pipes

Most underground sewer and drainage pipes are made of reinforced dry mix concrete, reinforce refers to the fact the concrete has steel bars inside it for added structural strength, dry mix refers to the type of concrete you can mold in then immediately extracted and it holds its shape. Concrete pipes can be as small as 25 centimeters or as large as three-and-a-half meters it has a 100 year life span dry mix concrete is made of stone course and. Portland cement which is a finely ground land of clay and limestone water and a chemical that access to water reducer trucks unload the sand and stone into outdoor storage bins the materials automatically drop onto a conveyor belt which transports them to storage silos above the factory floor to them and arrives by command tanker which blows it into a silo. All this I lost beat the mixture has the ingredients bland the cement and water combined to form a paste that counts the sand and stone the water reducer enables them to use minimal water. The less water the stronger and more durable the concrete, meanwhile workers use a special machine to build what's called the cage a circular steel frame that will form the pipes internal structure, its backbone they answered two and a half meter long steel rods in a circular, configuration pushing each rod part way through the machine to the other side. There an automated spot welder fuses a steel cable 21 round the machine begins turning wining the cable tightly around the bronze, here workers turning the machine manually just to show us the process in slow motion this is what it looks like at the normal automated speed as the rods passed through the machine the welder fuses the cable to them in one continuous spiral as the spiral cable reaches the end of the rods the machines cost spread outward forming a wider section on the end this is called the bell section. Workers position it on a base ring designed to hold the Cajun place then they close a hinged feel hungover and now they're ready to pour the concrete. A forklift transports the home to a machine called the Packer head their position the mold directly under it along drill like screw descends into the mold as concrete pour then this crew turns at high-speed moving up and down its blades propel the concrete outward against the mold walls forming the pie this process is called centrifugal projection. For me, the process for making large diameter pipes a slightly different a welder fuses spacers to the cage both inside and out these will send to the cage inside the home porkers position the cage on to a base ring then lower the outer part of the mold

called the outside form over it after securing it to the ring pay lower the unit over the smaller inner part of the mold call that the inside phone well and overhead final porous concrete into the cavity between the two molds for mines powerful electrical vibrators shake them home this forces the thick concrete downward filling the cavity this process is called the vibration forming with either pipe forming technique the molded concrete is quite fragile so the mall go off to the curing warehouse too hard and their workers remove them leaving the pied standing of bright houses transform the curing warehouse into a Sunnah, the temperature rises to 60 degrees Celsius the relative humidity 100 percent the concrete Hardin's in about 12 hours concrete pipes buried underground have to be able to withstand the way to the earth above them some the company subject sample pied too extreme pressure to test their maximum resistance concrete pipes join together with watertight rubber gaskets.

Unit 4 Published September, 15 2015

More than 4,500 years ago, Finnish pottery makers discovered a stone made of thin fibers that mixed really well with the clay they used to make pots. This stone was so strong, and yet flexible, that they could use it to make their pots thinner and bigger than ever. Plus, it was surprisingly resistant to heat, so the pots could hold things like hot metal. It seemed like a miracle stone, and eventually, the ancient Greeks, Romans, and Egyptians all started using it, too. That rock was what we now call asbestos, and eventually, we found out that it was too good to be true and stopped using it as much. But that took a while. The word asbestos actually refers to six different minerals that all have the same habit, or way that their crystals grow. They're called asbestiform, which just means that they grow in long, thin, flexible fibers. That flexibility, plus their strength and resistance to damage by heat and harsh chemicals, made these minerals incredibly useful in industry. The problem is, inhaling asbestos fibers can be dangerous. Because to your lungs, those flexible fibers are more like sharp little shards. You can probably imagine what happens if you breathe them in: they get stuck in the mucus lining of your lungs, which can make it difficult to breathe, inhale too many shards over time, and they can cause diseases like asbestosis, or scarring of the lungs, and mesothelioma, a type of lung cancer. The forms of asbestos with the highest health risks are a part of a group of rocks called amphiboles, and what makes them cause more health issues than others comes down to four of their chemical and structural properties. First, amphibole fibers are smaller, so they can travel deeper into the lungs. They're also sharper, so they can pierce your lungs more easily, causing inflammation or creating scar tissue. Plus, they're hydrophobic, or water-avoiding, which can keep them from dissolving in mucus if they dissolved, they could be coughed up and get out of your system. Finally, they contain iron, which can react with oxygen in your lungs and damage the DNA in your lung cells. The damaged DNA can then

make the cells to divide too quickly, leading to a tumor. So they may be more carcinogenic, or cancer forming, as well. So, how did asbestos go from being the miracle-rock of ancient potters to the scourge of modern industry? Even as far back as the Roman Empire, some 2,000 years ago, historians wrote about slaves getting what they called a “sickness of the lungs” after working in asbestos mines. And when the first commercial asbestos mines opened in Quebec in 1879, asbestos-related health issues started showing up in medical journals and case reports. One of the first well-studied deaths was in 1924 in the UK. Nellie Kershaw, who’d been spinning asbestos into yarn since she was 13, died at the age of 33 from asbestosis. When Parliament heard about the case, they asked a doctor known as E. R. A. Merewether to investigate the health of asbestos workers. For two years, he studied 374 workers at an asbestos textile factory. He found that inhaling asbestos fibers caused scarring in the lungs - and 17 out of 20 workers who had been there for more than 20 years ended up with asbestosis. Merewether presented his paper to parliament in 1930, and the UK started requiring ventilation in asbestos factories a year later. But it wasn’t until 2003 that asbestos was banned throughout the European Union. The asbestos industry in the United States is a whole other story. Asbestos was used a lot during World War II, since it was cheap, strong, and resistant to fire and chemicals. Naval war ships used asbestos insulation, and buildings were constructed with asbestos floor tiles, shingles, cements, and insulation for pipes. Production of asbestos in the United States finally started to slow down 1979, when nine asbestos manufacturers filed a lawsuit against the federal government. In 1975, they’d paid $69,000 to an asbestos worker who developed asbestosis, and they wanted to be reimbursed. But the government wouldn’t have any of that. Instead, they proved that the companies knew about, and had been hiding, asbestos-related health information for decades. The case got a lot of media attention, and people started to try to fix the problem by removing asbestos from buildings. But the US still hasn’t entirely banned the use of asbestos. Even so, asbestos won’t cause health issues for most people. Most of the fibers are so tightly bound into another material that they won't escape into the air unless you’re trying to remove the asbestos. Plus, every year we each breathe about a million fibers just from the natural erosion of asbestos-containing rocks. So unless you’re an asbestos worker who’s spent a lot of years without a ventilation mask, or you’re an ancient Finnish potter, you probably don’t have to worry about getting an asbestos-related illness.

Unit 5

How It's Made Bricks

Not only our bricks wall proof, they're also fire proof, pest resistant and weather-resistant no wonder they're one of the world's all this building materials bricks are often made, shale a lightweight rock that splits easily into thin layers quarry machines deak centimetres down to expose the shale to the elements for two years this weakens it making it easier to process once it

gets to the factory a four-foot high stone wheel with a steel Tire grimes the shale into powder it grinds up tonnes Schiaparelli our a screen sell any pieces that need more grinding the powder goes to the puck male which mixes it with water this makes a thick paste that will next go through the extrusion machine, the extruder forces the pace through a rectangular opening to form one long continuous piece called slog at the same time achieves of the Cross to your top layer talks polls what will become the face at the brick if this gray shale mixture is fired as he is it'll naturally produce a red brick to engineer a different color, they called the slog in send mixed with an oxide minerals such as zinc Orion next they texture the surface with a textured roller this is just one of many popular designs then a large knife comes down like a guillotine and slices the slug in foot length and you might be wondering where those three holes came from. Well remember have a piece goes through the extruder form the slog inside. They make three holes designed to decrease the bricks, how to each five foot length the cut 23-inch bricks the ones on the ends run even so they go back into the mix to make new slugs next comes the delicate job stacking these newly minted bricks to be deepen a machine first separates them then using inflating bags it grasps them raises them. Man stacks them meanwhile the water in the bricks is starting to evaporate to hasten that process the bricks go into a dryer for two days, the dryer get its hard here from the heat generated by the chilling with a brick school next for firing in mckellan is really a giant Alvin. It fires the bricks at one thousand forty degrees Celsius, that's almost 2,000 degrees Fahrenheit. One and a half days later the bricks are ready to transfer. Machine takes the mound. But before they go to market a technician does a quality check, he weighs and measures a sample to see if it meets the design specifications. Bricks are supposed to absorb some water but not too much yet if they repel water completely bill also repel the web more to the Masons use to stick the bricks together so to test absorbency the technician breaks a break in half, he weighs it to be four and after soaking in water for 24 hours by comparing the weights you can see how much water the brick has absorbed once the batch gets the OK. Each brick weighs five and a half pounds. Brick is one of the sturdiest building materials around, it doesn't draw fayed warp or dance the way some other materials can. Bricks are also energy-efficient, they absorb heat to help cool your house in the summer and hold heat to help keep it warmer in the winter.

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