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English in Engineering

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English in Engineering

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Учебное пособие “English in Engineering” предназначено для студентов-бакалавров 1 курса дневной формы обучения инженерно-строительных вузов, обучающихся по профилям «Теплогазоснабжение и вентиляция», «Водоснабжение и водоотведение». Основные цели учебного пособия – развитие и совершенствование умения читать и переводить специализированные тексты на английском языке, формирование речевых навыков в сфере профессиональной коммуникации, расширение словарного запаса, повторение базовых грамматических структур.

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Предисловие

Данное учебное пособие предназначено для студентов-бакалавров 1 курса, обучающихся по направлениям подготовки «Строительство» по профилям «Теплогазоснабжение и вентиляция», «Водоснабжение и водоотведение.

Целью учебного пособия является развитие и совершенствование умений и навыков устной речи в деловой и общепрофессиональной коммуникации, а также умения понимать и переводить специализированную литературу на английском языке.

Учебное пособие состоит из двух тематических глав («Водоснабжение и водоотведение», «Теплогазоснабжение»), 9 подразделов (Units) включающих аутентичные описательные тексты, которые тематически связаны друг с другом и касаются различных сторон темы или расширяют ее. В каждом подразделе представлены лексические упражнения, направленные на расширение словарного запаса по специальности, усвоение прочитанного материала. Упражнения имеют коммуникативную направленность и позволяют активизировать приобретенные навыки в речи. Каждый раздел содержит контрольные задания (Final Tasks), направленные на контроль усвоения пройденного материала. Данное пособие направлено на развитие разных видов речевой деятельности: чтения, диалогической и монологической речи, навыков письменного и устного перевода.

Все задания построены на активной лексике раздела. Помимо языковых заданий, даются задания на развитие навыков устной речи. Задания, предлагаемые в блоке *Speaking*, носят творческий характер и направлены на формирование коммуникативных навыков в условно-заданных речевых ситуациях, а также творческого мышления и умения формулировать собственное мнение.

Пособие снабжено приложением (Appendix), где представлены аутентичные тексты, которые могут быть использованы как для аудиторной, так и для самостоятельной работы студентов. Тексты данного раздела могут быть использованы как для формирования навыков различных видов чтения, так и для развития речевых навыков. Эти тексты также могут служить материалом для обучения студентов реферированию и аннотированию текстов. Кроме того, эти тексты дают возможность дифференцировать обучение в зависимости от языковой компетенции студентов.

Разработанное пособие содержит задания, которые помогут студентам научиться вести беседы на различные темы из области профессиональной коммуникации на английском языке.

Unit 1. WATER. GENERAL INFORMATION

Text 1A

1. Before you start.

- How can you define water?
- Why is water important for a human being?

2. Read the words and learn them by heart. Make up your own sentences with them.

1. **Transparent** – прозрачный
2. **Fluid** – жидкость
3. **Constituent** – элемент, составная часть
4. **Bond** – связь
5. **Ambient** – окружающий, внешний, нормальная (температура)
6. **Solid** – твердый, плотный
7. **Vital** – жизненно важный, крайне необходимый
8. **Ice cap** – ледник
9. **Fraction** – частица, доля
10. **Vapour** – пар, туман
11. **Particle** – частица, крупица
12. **Precipitation** – выпадение осадков
13. **Evaporation** – испарение, парообразование
14. **Transpiration** – испарение воды растительностью
15. **Runoff** – водосток
16. **To contribute** – делать вклад, способствовать, содействовать
17. **Sanitation** – санитарная очистка, дезинфекция, обеззараживание
18. **Solvent** – растворитель

3. Read the text 1A, translate it and compare your ideas in ex.1 with the facts.

General Aspects of Water

Source: http://www.montessori-allgaeu.de

Water is a transparent fluid which forms the world's streams, lakes, oceans and rain, and is the major constituent of the fluids of living things. As a chemical compound, a water molecule contains one oxygen and two hydrogen atoms that are connected by covalent bonds. Water is a liquid at standard ambient temperature and pressure, but it often co-exists on Earth with its solid state, ice; and gaseous state, steam (water vapour).

Source: effects1.ru

Water covers 71% of the Earth's surface. It is vital for all known forms of life. On Earth, 96.5% of the planet's water is found in seas and oceans, 1.7% in groundwater, 1.7% in glaciers and the ice caps of Antarctica and Greenland, a small fraction in other large water bodies, and 0.001% in the air as vapor, clouds (formed of solid and liquid water particles suspended in air), and precipitation. Only 2.5% of the Earth's water is freshwater, and 98.8% of that water is in ice and groundwater. Less than 0.3% of all freshwater is in rivers, lakes, and the atmosphere, and an even smaller amount of the Earth's freshwater (0.003%) is contained within biological bodies and manufactured products.

Water on Earth moves continually through the water cycle of evaporation and transpiration, condensation, precipitation, and runoff, usually reaching the sea.

Evaporation and transpiration contribute to the precipitation over land. Water used in the production of a good or service is known as virtual water.

Source: www.isciencetimes.com

Safe drinking water is essential to humans and other life forms even though it provides no calories or organic nutrients. Access to safe drinking water has improved over the last decades in almost every part of the world, but approximately one billion people still lack access to safe water and over 2.5 billion lack access to adequate sanitation.

However, some observers have estimated that by 2025 more than half of the world population will be facing water-based vulnerability. Water plays an important role in the world economy, as it functions as a solvent for a wide variety of chemical substances and facilitates industrial cooling and transportation. Approximately 70% of the fresh water used by humans goes to agriculture.

(Source: http://en.wikipedia.org/wiki/Water)

4. Say if the sentences concerning Text 1A are true or false.

1. Water is the chemical substance composed of carbon and oxygen.
2. Water has only liquid form or state.
3. Water covers 80% of the Earth's surface.
4. By 2025 more than half of the world population will be facing water-based vulnerability.
5. About 70% of freshwater is consumed by industrial sector.
6. Water is the universal solvent.
7. The oceans contain 94% of the Earth's water.

5. Answer the following questions.

1. What is water according to the text?
2. What does a water molecule contain? What is its chemical formula?
3. How is water distributed on the Earth?
4. What states of water do you know?
5. What does the water cycle consist of?
6. Why is safe drinking water essential to humans?
7. How does water play an important part in the world economy?

6. Give English equivalents of the following words and word combinations from Text 1A.

Прозрачная жидкость, живые существа, молекула воды, ковалентные связи, твердое состояние, при комнатной температуре, водяной пар, доступ к чистой питьевой

воде, столкнуться с нехваткой воды, растворитель, рыночная экономика, химические вещества, промышленное охлаждение, приблизительно, пресная вода, сельское хозяйство.

7. Using vocabulary in ex.2 match the words with their definitions.

Word	Definition
1. water	**a.** hard or firm; not in the form of a liquid or gas.
2. transparent	**b.** the equipment and systems that keep places clean, especially by removing human waste.
3. solid	**c.** protected from any danger or harm.
4. vapour	**d.** a substance, especially a liquid, that can dissolve another substance.
5. sanitation	**e.** the mass of salt water that covers most of the earth's surface.
6. solvent	**f.** to make smb. do or have smth., especially because it is necessary according to a particular law or set of rules.
7. ocean	**g.** a liquid without colour, smell or taste that falls as rain, is in lakes, rivers and seas, and is used for drinking, washing, etc.
8. to require	**h.** a mass of very small drops of liquid in the air, for example steam.
9. safe	**i.** the act of using energy, food or materials.
10. consumption	**j.** (of glass, plastic, etc.) allowing you to see through it.

8. Put the words from the text in the correct order to make up sentences.

1. things, major, is, water, living, the, of, fluids, the, of, constituent.
2. atoms, molecule, a, one, water, hydrogen, two, oxygen, contains, and.
3. surface, 71%, the, of, covers, Earth's, water.
4. vital, all, known, life, of, forms, water, is, for.
5. economy, in, world, the, plays, water, an, role, important.

9. Discuss with the group the following topics:

- What countries are rich in water resources?
- Where do people suffer scarcity of fresh water?
- Why did you decide to become a water engineer?

Text 1B

1. Before you start.

- What main characteristics of water can you define?
- What physical states of water do you know?

2. Read the words and learn them by heart. Make up your own sentences with them.

1. **Abundant** – обильный, изобилующий
2. **To exist** – существовать
3. **Equilibrium** – равновесие
4. **To dissolve** – растворять(ся), разжижать
5. **Property** – свойство, качество, собственность
6. **To vary** – изменяться, варьировать
7. **Substance** – вещество, состояние
8. **Amalgamated** – объединенный, амальгамированный
9. **To accumulate** – аккумулировать, накапливать
10. **To suspend** – вешать, подвешивать
11. **To merge** – объединить, поглощать
12. **To scald** – ошпаривать, обжигать
13. **Scalding** – обжигающий, горячий
14. **Supercritical fluid** – надкритическая жидкость, сверхкритическая среда

3. Read the text 1B, translate it and compare your ideas in ex.1 with the facts.

Properties of Water

Water (H2O) is the most abundant compound on Earth's surface, covering 70 percent of the planet. In nature, water exists in liquid, solid, and gaseous states. It is in dynamic equilibrium between the liquid and gas states at standard temperature and pressure. At room temperature, it is a tasteless and odorless liquid, nearly colorless with a hint of blue. Many substances dissolve in water and

it is commonly referred to as *the universal solvent*. Because of this, water in nature and in use is rarely pure and some properties may vary from those of the pure substance. However, there are also many compounds that are essentially, if not completely, insoluble in water. Water is the only common substance found naturally in all three common states of matter and it is essential for all life on Earth. Water makes up 55% to 78% of the human body.

Forms of water. Like many substances, water can take numerous forms that are broadly categorized by phase of matter. The liquid phase is the most common among water's phases (within the Earth's atmosphere and surface) and is the form that is generally denoted by the word "water." The solid phase of water is known as ice and commonly takes the structure of hard, amalgamated crystals, such as ice cubes, or loosely accumulated granular crystals, like snow. The gaseous phase of water is known as water vapor (or steam), and is characterized by water assuming the configuration of a transparent cloud. (Note that visible steam and clouds are, in fact, water in the liquid form as minute droplets suspended in the air.) The fourth state of water, that of a supercritical fluid, is much less common than the other three and only rarely occurs in nature, in extremely uninhabitable conditions. When water achieves a specific critical temperature and a specific critical pressure (647 K and 22.064 MPa), liquid and gas phase merge to one homogeneous fluid phase, with properties of both gas and liquid. One example of naturally occurring supercritical water is found in the hottest parts of deep water hydrothermal vents, in which water is heated to the critical temperature by scalding volcanic plumes and achieves the critical pressure because of the crushing weight of the ocean at the extreme depths at which the vents are located. Additionally, anywhere there is volcanic activity below a depth of 2.25 km (1.40 mi) can be expected to have water in the supercritical phase.

(Source: http://en.wikipedia.org/wiki/Properties_of_water)

4. Say if the sentences concerning Text 1B are true or false.

1. Water covers 60 percent of the planet.
2. Water exists in liquid, solid, and gaseous states.
3. At room temperature water has taste and odor.
4. Substances do not dissolve in water.
5. Water makes up 55% to 78% of the human body.
6. Water can exist only in the liquid phase.
7. Supercritical water is found in the hottest parts of deep water hydrothermal vents.

5. Answer the following questions.

1. In what states does water exist in nature?
2. What are the water properties at room temperature?
3. Why can water be called the universal solvent?
4. What is the most common water phase?
5. What structure does the solid phase of water take?
6. Characterize the gaseous state of water.
7. Where does a supercritical fluid occur in nature?

6. Give English equivalents of the following words and word combinations from Text 1B.

Наиболее хорошо распространенное соединение, жидкость без вкуса и запаха, с голубым оттенком, нерастворимые в воде, необходимый для жизни на Земле, состояние вещества, укрупненный кристалл, прозрачное облако, мельчайшие капли, сверхкритическая среда, гидротермальные источники, вулканический шлейф, сокрушающая сила, экстремальные глубины.

7. Read the sentences and choose the correct words.

1. The wall was **durable / brittle**, so it cracked easily.
2. The architect installed a(n) **opaque / transparent** panel to let in more light.
3. The **flexible / rigid** sealant can be squeezed into small spaces.
4. The door is **heavy / lightweight**, so one person can easily carry it.
5. The **function / impression** of a water tap is to provide water.
6. The contractors installed wooden **partition / siding** on the exterior.
7. If a shape has only three sides, it is a **diamond / triangle**.

8. Read and find Russian equivalents to the following English proverbs and sayings. Express your thoughts on these topics and explain the meaning of them.

- Beware of a silent dog and still water.
- To go through fire and water.
- A great ship asks deep waters.

9. Match the following words with their synonyms.

1. transparent	**a.** happiness
2. to transport	**b.** donation
3. to transmit	**c.** competent
4. satisfaction	**d.** obvious
5. vital	**e.** precious
6. contribution	**f.** to yell
7. professional	**g.** to carry
8. valuable	**h.** to gleam
9. to shout	**i.** dynamic
10. to shine	**j.** to transfer

Text 1C

1. Before you start.

- In pairs, think of five things we use water for.
- What regions suffer water scarcity?
- How do people try to solve this problem?

2. Read the text 1C, translate it and compare your ideas in ex.1 with the facts.

Hydro-Logical

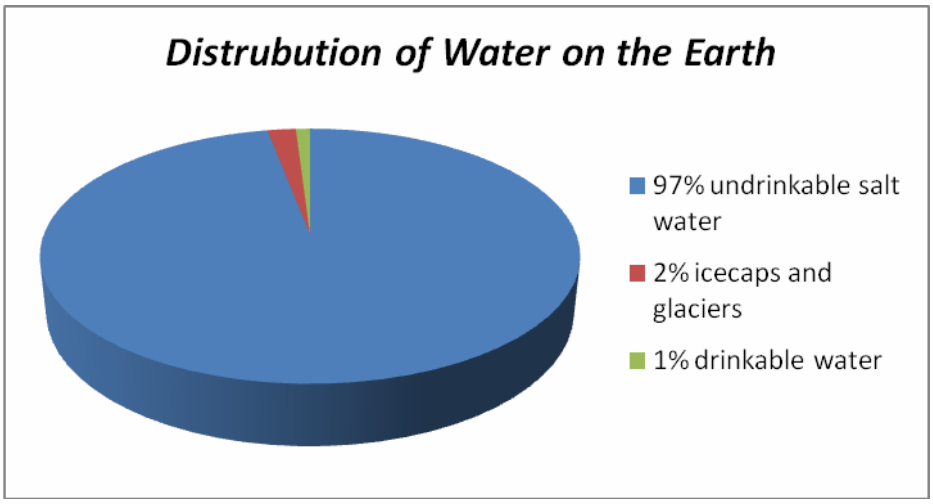
We may **take it for granted**, but water is the most important **resource** on Earth. It covers 80% of the Earth's surface and it's the only substance that can be found naturally in three forms: solid, liquid and gas. Water also makes up 66% of the human body and without it we can't live for more than a week.

Although water is the most common **substance** on Earth, we should use it carefully because only 1% is **drinkable** and 1/3 of all the people in the world can't get enough clean water. Today, we use 3 times more water than in 1950, and people in rich countries use 10 times

more than those in poor ones. So where does it all go? Well, a single **dripping** tap can waste up to 7,600 litres of water in a year and a **leaking** toilet can waste about 260 litres in a day.

At home, we can help by fixing **broken taps** and toilets. Having showers instead of baths could save about 300 litres of water a week. We should also avoid using chemicals that **pollute** the water supply, because we can't increase the amount of fresh water in the world. We can only change the way we use it.

(Source: www.expresspublishing.co.uk/elt/upstream)



3. Say if the sentences concerning Text 1C are true or false.

1. 66% of the Earth's water is drinkable.
2. Humans can live for seven days without water.
3. People use 1/3 of the water on Earth.
4. Having baths instead of showers wastes water.
5. We can't increase the water supply.

4. Make the following words negative by adding the prefixes in- or un-.

1. adequate	*inadequate*	6. efficient	_____
2. appropriate	_____	7. reliable	_____
3. consistent	_____	8. sufficient	_____
4. economical	_____	9. suitable	_____
5. effective	_____		

5. Read the following water saving tips and discuss them with your groupmates.

Water Saving Tips

The following are some recommendations of the Environment Agency for reducing your consumption of water.

Source: energo-zhkh.ru

1. Vegetables and fruit should be washed in a bowl rather than under a **running tap**. The leftover water can be used for watering house plants.

2. Use the minimum amount of water required when you boil water in saucepans and kettles. That way, you'll save energy as well as water.

3. Try keeping a bottle or jug of water in the fridge instead of running taps until the water runs cold.

4. **Half-load programmes** on dishwashers and washing machines use more than half the water and energy of a **full load**. Wait until you have a full load before switching the machine on.

5. Try not to leave the tap running while you brush your teeth, shave or wash your hands. This can waste up to 5 litres of water per minute.

6. A 5-minute shower uses about a third of the water of a bath. But remember that power showers can use more water than a bath in less than 5 minutes.

7. Old toilet cisterns can use as much as 9 litres of clean water every **flush**. Reduce this by placing a 'save-a-flush' or 'hippo' in the cistern.

8. Cotton wool and tissues should be put in a waste bin rather than flushed down the toilet.

9. **Dripping taps** can waste up to 4 litres of water a day. Replace worn tap washers for a quick and cheap way of saving water.

10. Burst water pipes can cause serious damage as well as wasting water. Ensure your water pipes and external taps **are lagged** in time for the cold winter months.

(Source: www.theguardian.com)

5.1. Suggest your own three extra tips to save water.

5.2. Convince your partner of the necessity of saving water.

5.3. Make up a dialogue.

6.1. Explain words in bold in ex. 2 and 5, and make your own sentences with them.

6.2. Make up 6 questions to the text.

Final Tasks

1. Fill in the gaps using the words below:

Vital, contributed, vapour, solvent, transpiration, exists, transparent, evaporates, solid, dissolve.

1. The insect's wings are almost _____. 2. Water is _____ for animals and human beings. 3. If a liquid _____, it changes into a gas. 4. They _____ $2000 to water resources fund. 5. The ship bumped against a _____ solid object, perhaps an iceberg. 6. Water _____, when heated, is very hot and can be dangerous. 7. The process of water passing out from the surface of a plant or leaf is called _____. 8. Lead is more _____ in acidic water. 9. Water _____ in three main forms: liquid, solid and gaseous. 10. Salt and sugar _____ in water.

2. Translate the following sentences using the vocabulary of Unit 1.

1. Эта ткань легкая и прозрачная. 2. Витамины жизненно важны для здоровья. 3. Благодаря солнцу происходит испарение влаги с поверхности земли. 4. Этот ученый внес большой вклад в развитие современных систем очистки воды. 5. Она отказалась от любой твердой пищи. 6. Будь осторожен, не обожгись водным паром! 7. Многие болезни возникают из-за плохой (poor) очистки воды. 8. Этот растворитель хорошо удаляет пятна с одежды. 9. Ацетон (acetone) – хороший растворитель. 10. В нашем регионе температура воздуха зимой колеблется от 0° до - 30° градусов.

3. Speaking. Make a presentation on the following topic.

Project. How much do you know about water? Work in groups. Collect information about water, then prepare a quiz for your classmates.

4. Choose the sentence that uses the underlined part correctly.

1. **A** To make concrete, the builders use different types of metal.
   B The second floor is supported by I-beams.

2. **A** Rebar is often used for decoration.
   B Aggregate is a mixture of sand, gravel, and broken stones.

3. **A** They made the floor with a stone called granite.
   B Steel is a very unstable material.

4. **A** Sand is mostly made up of iron.
   B Fire does not destroy walls made of bricks.

5. Retell the following English joke.

A physicist, biologist and a chemist were going to the ocean for the first time. The physicist saw the ocean and was fascinated by the waves. He said he wanted to do some research on the fluid dynamics of the waves and walked into the ocean. Obviously he was drowned and never returned.

The biologist said he wanted to do research on the flora and fauna inside the ocean and walked inside the ocean. He too, never returned.

The chemist waited for a long time and afterwards, wrote the observation, "The physicist and the biologist are soluble in ocean water".

(Source: http://www.waterqualityplus.com/waterjokes.htm)

Unit 2. WATER TREATMENT

Text 2A

1. Before you start.

- How can you define water treatment.
- Why is a good water treatment system essential for people?

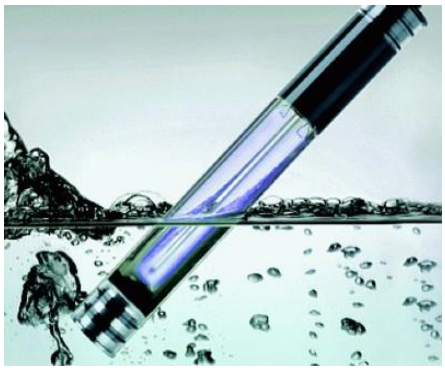
2. Read the words and learn them by heart. Make up your own sentences with them.

1. **To secure** – обеспечивать безопасность, надежно защищать
2. **To maintain** – сохранять, защищать
3. **Water supply** – водоснабжение
4. **Development** – 1) развитие, рост; 2) застройка, жилищный комплекс, новое строительство
5. **Available** – доступный, имеющийся в наличии
6. **To exert** – повлиять, оказывать давление
7. **Contamination** – загрязнение (воды)
8. **Waste** – отходы, отбросы
9. **Deterioration** – ухудшение, порча, снижение качества
10. **Rigorous** – суровый, жесткий
11. **To detect** – открывать, находить, обнаруживать
12. **To overlook** – не обращать внимания, не замечать
13. **Potable** – питьевой
14. **Water treatment** – очистка воды
15. **To process** – обрабатывать, подвергать обработке
16. **To encompass** – заключать (в себе), касаться

3. Read the text 2A, translate it and compare your ideas in ex.1 with the facts.

Water Treatment

Securing and maintaining an adequate supply of water has been one of the essential factors in the development of human settlements. The earliest developments were primarily concerned with the quantity of water available. Increasing population, however, has exerted more pressure on limited high-quality surface sources, and the contamination of water with municipal, agricultural, and industrial wastes has led to a deterioration of water quality in many other sources. At the same time, water quality regulations have become more rigorous, analytical capabilities for detecting contaminants have become more sensitive, and the general public has become both more knowledgeable and more discriminating about water quality. Thus, the quality of a water source cannot be overlooked in water supply development. In fact, virtually all sources of water require some form of treatment before potable use.



Source: http://drinkingwaterz.com

Water treatment can be defined as the processing of water to achieve a water quality that meets specified goals or standards set by the end user or a community through its regulatory agencies. Goals and standards can include the requirements of regulatory agencies, additional requirements set by a local community, and requirements associated with specific industrial processes. The evolution of water treatment practice has a rich history of empirical and scientific developments and challenges met and overcome.

Water treatment, however, encompasses a much wider range of problems and ultimate uses, including home treatment units, community treatment plants, and facilities for industrial water treatment with a wide variety of water quality requirements that depend on the specific industry. Water treatment processes are also applicable to remediation of contaminated groundwater and other water sources and wastewater treatment when the treated wastewater is to be recycled for new uses.

(Source: Crittenden J.C. Water Treatment: Principles and Design, pp.1-2)

4. Say if the sentences concerning Text 2A are true or false.

1. The earliest developments were primarily concerned with the quality of water available.
2. Later on the general public has become both more knowledgeable and more discriminating about water quality.
3. Sources of water do not require any form of treatment before potable use.
4. Water treatment can be defined as the processing of water to achieve a water quality that meets specified goals or standards set by the end user or a community through its regulatory agencies.
5. Water treatment encompasses a very narrow range of problems.

5. Answer the following questions.

1. What were the essential factors in the development of human settlements?
2. What were the earliest developments primarily concerned with?
3. What types of wastes can you enumerate?
4. How have water quality regulations changed over time?
5. What requirements can goals and standards include?
6. What range of problems and ultimate uses does water treatment encompass?
7. Where are water treatment processes also applicable?

6. Discuss the following questions with your groupmates.

- What measures of water treatment can be taken at home?
- What measures of water treatment does your family use?

7. Give English equivalents of the following words and word combinations from Text 2A.

Водоснабжение надлежащего качества, развитие поселений, с ростом численности населения, поверхностные водные источники, загрязнение воды, промышленные отходы, ухудшение качества воды, нормативные требования к качеству воды, обнаруживать загрязнения, конечный потребитель (пользователь), органы государственного регулирования, местные жители, специфические промышленные процессы, конечное потребление, блок очистки воды в домашних условиях, очищенные сточные воды.

8. Complete the following table.

Verb	Noun	Adjective
manufacture		
	success	
expand		
implement		
		sustainable
contaminate		
risk		
consume		
	strength	
		applicable
	process	

Text 2B

1. Before you start.

- Do you know any water treatment techniques?
- Why is it important to treat water?

2. Read the words and learn them by heart. Make up your own sentences with them.

1. **Boiling** – кипение, кипячение
2. **To evolve** – развиваться
3. **To clarify** – очищать, делать прозрачным
4. **To appreciate** – ценить, оценивать, принимать во внимание
5. **To shift** – перемещать, передвигать
6. **Objective** – цель, стремление, основная задача
7. **To transmit** – передавать, пропускать
8. **To emanate** – выделять, выделяться, излучать
9. **Coliform test** – исследование на бактерии коли

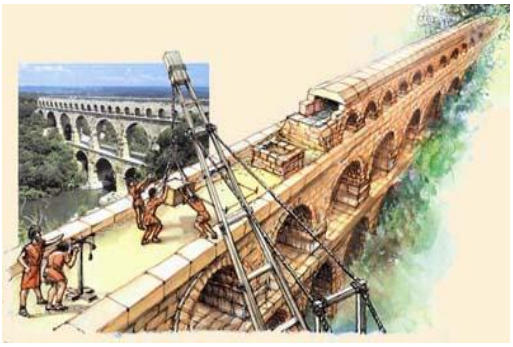
10. **To assess** – оценивать, вычислять
11. **Robust** – сильный, активный, надёжный
12. **Acute** – острый, тяжелый (о болезни)
13. **To prevent** – предотвращать, предупреждать
14. **Trace quantities** – ничтожное количество, микроколичество
15. **Coagulation** – коагуляция, слияние, свертывание, сгущение
16. **Flocculation** – флокуляция, выпадение в осадок в виде хлопьев
17. **Sedimentation** – осветление, механическая очистка сточных вод
18. **Filtration** – фильтрация, пропускание через фильтр

3. Read the text 2B, translate it and compare your ideas in ex.1 with the facts.

History of the Development of Water Treatment

One of the earliest water treatment techniques (boiling of water) was primarily conducted in containers in the households using the water. From the sixteenth century onward, however, it became increasingly clear that some form of treatment of large quantities of water was essential to maintaining the water supply in large human settlements.

The health concerns from drinking water have evolved over time. While references to filtration as a way to clarify water go back thousands of years, the relationship between water quality and health was not well understood or appreciated. Treatment in those days had as much to do with the aesthetic qualities of water (clarity, taste, etc.) as it did on preventing disease. The relationship between water quality and health became clear in the nineteenth century, and for the first 100 years of the profession of water treatment engineering, treatment was focused on preventing waterborne disease outbreaks. Since 1970, however, treatment objectives have become much more complex as public health concerns shifted from acute illnesses to the chronic health effects of trace quantities of anthropogenic (manmade) contaminants.



Source: http://www.kupitfilter.ru

In the middle of the nineteenth century it was a common belief that diseases such as cholera and typhoid fever were primarily transmitted by breathing miasma, vapors emanating from a decaying victim and drifting through the night. This view began to change in the last half of that century. In 1854, Dr. John Snow demonstrated that an important cholera epidemic in London was the result of water contamination (Snow, 1855). Ten years later, Dr. Louis Pasteur articulated the germ theory of disease. Over the next several decades, a number of doctors, scientists, and engineers began to make sense of the empirical observations from previous disease outbreaks.

By the late 1880s, it was clear that some important epidemic diseases were often waterborne, including cholera, typhoid fever, and amoebic dysentery (Olsztynski, 1988). As the nineteenth century ended, methods such as the coliform test were being developed to assess the presence of sewage contamination in a water supply (Smith, 1893), and the conventional water treatment process (coagulation/flocculation/sedimentation/filtration) was being developed as a robust way of removing contamination from municipal water supplies (Fuller, 1898).

(Source: Crittenden J.C. Water Treatment: Principles and Design, pp.1-2)

4. Say if the sentences concerning Text 2B are true or false.

1. Boiling of water was primarily conducted in kettles.
2. The health concerns from drinking water have evolved over time.
3. The relationship between water quality and health has always been well understood and appreciated.
4. In 1879, Dr. John Snow demonstrated that an important cholera epidemic in London was the result of water contamination.
5. Cholera epidemic in Paris was the result of water contamination.
6. Dr. Louis Pasteur articulated the virus theory of disease.

5. Answer the following questions.

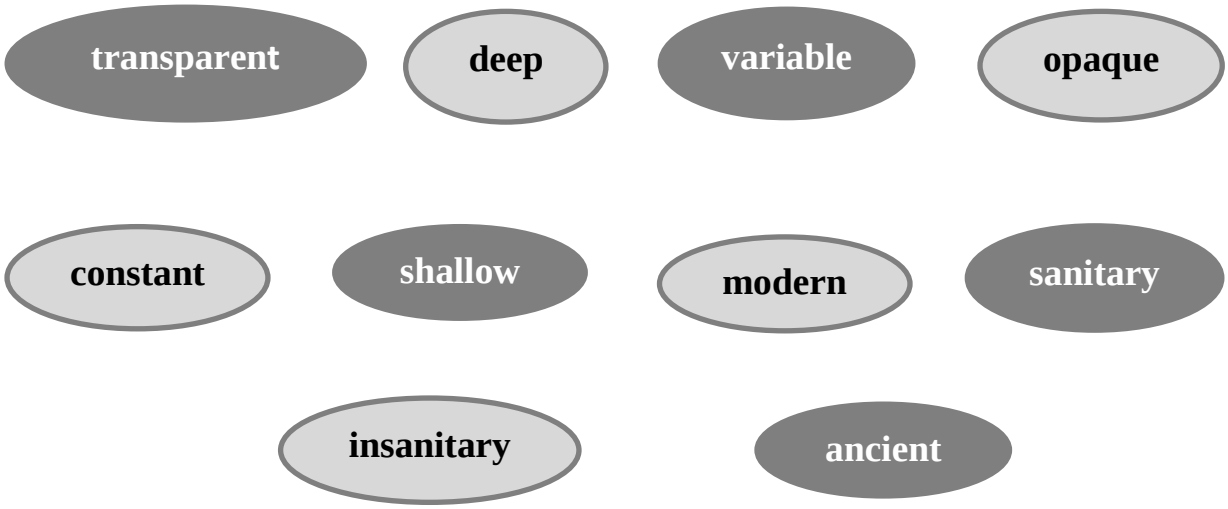
1. What was one of the earliest water treatment techniques?
2. What was water treatment aimed at in early times?
3. When did the relationship between water quality and health become clear?
4. Why have treatment objectives become much more complex since 1970?

5. What was a common belief of cholera and typhoid transmission in the middle of the nineteenth century?
6. What theory did Dr. Louis Pasteur articulate?
7. What conventional water treatment process was developed at the end of the nineteenth century?

6. Give Russian equivalents of the following words and word combinations from Text 2B.

To clarify water, to prevent disease, the health concerns, water treatment engineering, water borne disease outbreaks, trace quantities, manmade contaminants, breathing miasma, vapors emanating from a decaying victim, germ theory of disease, empirical observations, sewage contamination, coagulation, flocculation, sedimentation, filtration.

7. Match the following words with their antonyms.



8. Discuss the following topic and make up the report. Use the sources of the Internet to help you.

- Speak about problems concerning water treatment that people faced in ancient times. Illustrate your report with examples and figures.

Text 2C

1. Before you start.

- What water treatment techniques are used nowadays?
- Do you use water filter at home?

2. Read the words and learn them by heart. Make up your own sentences with them.

1. **Signpost** – указатель, указательный знак
2. **Virtual** – фактический, действительный
3. **Elimination** – уничтожение, исключение
4. **Turbid water** – мутная вода
5. **To develop** – *зд.* распространяться, появляться
6. **To settle** – *зд.* давать осадок, отстояться
7. **Recognition** – признание, определение
8. **Plausible** – убедительный, внушающий доверие
9. **Screen** – экран
10. **Scrubber** – жесткая щетка, скребок, промывочное устройство
11. **Susceptible to** – подверженный, чувствительный к чему-либо
12. **Lime** – известь
13. **Objectionable** – вредный

3. Read the text 2C, translate it and compare your ideas in ex.1 with the facts.

Modern Water Treatment Methods

The twentieth century began with the development of continuous chlorination as a means for bacteriological control, and in the first four decades the focus was on the implementation of conventional water treatment and chlorine disinfection of surface water supplies. By 1940, the vast majority of water supplies in developed countries had ‘‘complete treatment’’ and were considered microbiologically safe. In fact, during the 1940s and 1950s, having a microbiologically safe water supply became one of the principal signposts of an advanced civilization. The success of filtration and disinfection practices led to the virtual elimination of

the most deadly waterborne diseases in developed countries, particularly typhoid fever and cholera.

Most of the methods in use at the beginning of the twentieth century evolved out of physical observations (e.g., if turbid water is allowed to stand, a clarified liquid will develop as the particles settle) and the relatively recent (less than 120 years) recognition of the relationship between microorganisms in contaminated water and disease. A list of plausible methods for treating water at the beginning of the twentieth century was presented in a book by Hazen (1909) and is summarized in Table 2.1. It is interesting to note that all of the treatment methods reported in Table 2.1 are still in use today. The most important modern technological development in the field of water treatment not reflected in Table 2.1 is the use of membrane technology.

(Source: Crittenden J.C. Water Treatment: Principles and Design)

Table2.1. **Summary of methods used for water treatment**

Treatment Method	**Agent/Objectives**
I. Mechanical separation	➢ By gravity – sedimentation ➢ By screening – screens, scrubbers, filters ➢ By adhesion – scrubbers, filters
II. Coagulation	➢ By chemical treatment resulting in drawing matters together into groups, thereby making them more susceptible to removal by mechanical separation but without any significant chemical change in the water
III. Chemical purification	➢ Softening – by use of lime ➢ Iron removal ➢ Neutralization of objectionable acids
IV. Poisoning processes (now known as disinfection processes)	➢ Ozone ➢ Sulfate of copper ➢ The object of these processes is to poison and kill objectionable organisms without at the same time adding substances objectionable or poisonous to the users of the water

V. Biological processes	➢ Oxidation of organic matter by its use as food for organisms that thereby effect its destruction ➢ Death of objectionable organisms, resulting from the production of unfavorable conditions, such as absence of food (removed by the purification processes) and killing by antagonistic organisms
VI. Aeration	➢ Evaporation of gases held in solution that are the cause of objectionable tastes and odors ➢ Evaporation of carbonic acid, a food supply for some kinds of growths ➢ Supplying oxygen necessary for certain chemical purifications and especially necessary to support growth of water-purifying organisms
VII. Boiling	• Best household method of protection from disease-carrying waters

(Source: Crittenden J.C. Water Treatment: Principles and Design)

4. Answer the following questions.

1. What water treatment method emerged in the beginning of the twentieth century?
2. What became one of the principal signposts of an advanced civilization during the 1940s and 1950s?
3. What practices led to the virtual elimination of the most deadly waterborne diseases in developed countries?
4. What deadly waterborne diseases were eliminated due to the implementation of the new water treatment methods?
5. How did most of the methods in use at the beginning of the twentieth century evolve?
6. What is membrane technology?
7. What are the objectives of disinfection?
8. What is the best household method of protection from disease-carrying waters?

5. Read the sentence pairs. Choose where the words best fit in the blanks.

1. **Contain / suspend**

   A lamp was suspended from the ceiling.

   The bottle _____ three litres.

2. **Insert / project**

   A tube was _____ between two buildings.

   The _____ housing development will go ahead next year.

3. **Position / locate**

   They _____ their headquarters in London.

   Large television screens were _____ at either end of the stadium.

4. **Fasten / tie**

   People must _____ their seatbelts on plane's takeoff and landing.

   He _____ a knot in the rope.

5. **Creative / persistent**

   A _____ person will not give up easily.

   _____ people come up with unique ideas.

6. Think of the situations where you can use the following idioms.

To be (all) at sea, to be in deep waters, to be in hot water, to be in low water, to be in the clouds, to be in the swim, to skate on thin ice, between the devil and the deep blue sea, a big fish in a little pond, one's blood turns to ice, to blow off steam, to break the ice, as cold as ice, come hell or high water, to cut no ice with smb.

7. Discussion.

- Using Table2.1 and the Internet resources find and discuss pluses "+" and minuses "–" of each water treatment method.

Final Tasks

1. Match the following terms with the appropriate definitions.

pH, absorption, purification, desalination, distillation, aeration, disinfection, filtration, chlorination, sedimentation.

a) The process of passing liquid through a special device, especially to remove sth. that is not wanted.

b) The process of making a liquid pure by heating it until it becomes a gas, then cooling it and collecting the drops of liquid that form.

c) The process of removing salt from sea water.

d) The process of putting a poisonous greenish gas with a strong smell into water to keep it clean.

e) The process of depositing the solid material that settles at the bottom of a liquid.

f) The process of using a substance that kills bacteria.

g) The process of a liquid, gas or other substance being taken in.

h) The process of adding a gas, especially carbon dioxide, to a liquid under pressure.

i) Parameter describing the acid-base properties of a solution.

j) The process of making sth. clean by removing substances that are dirty, harmful or not wanted.

2. Render the following text into English.

На сегодняшний день одним из самых распространенных способов повышения качества очистки питьевой воды, применяемых в России, является скорая фильтрация. Этот процесс заключается в том, что на завершающей стадии очистки воду пропускают через песчаные фильтры. Это делается для того, чтобы избавить воду от

мелких взвесей, оставшихся после предварительных процессов очистки воды. Главное преимущество данной технологии – это простота реализации. Суть ее в следующем: предварительно очищенная вода поступает в резервуар с засыпанным в него песком определенной фракции. Проходя через песок, вода фильтруется. Когда уровень воды в фильтре превышает определенную величину или качество воды не соответствует требуемым параметрам, происходит процесс промывки фильтра, вода подается в обратном направлении. Преимущество данного типа фильтрации заключается в том, что он очень легко поддается автоматизации и может быть органично вписан в концепцию децентрализованной автоматизации.

3. Find all the words and give their translation.

b	**l**	**a**	**c**	**k**	**w**	**a**	**t**	**e**	**r**
a	**b**	**c**	**h**	**u**	**m**	**i**	**d**	**d**	**e**
f	**s**	**a**	**b**	**s**	**o**	**r**	**b**	**g**	**h**
i	**e**	**g**	**o**	**x**	**y**	**g**	**e**	**n**	**k**
a	**w**	**p**	**o**	**t**	**a**	**b**	**l**	**e**	**l**
l	**a**	**m**	**n**	**o**	**w**	**a**	**t**	**e**	**r**
k	**g**	**p**	**c**	**l**	**a**	**r**	**i**	**f**	**y**
a	**e**	**q**	**r**	**p**	**u**	**r**	**e**	**s**	**t**
l	**d**	**r**	**o**	**u**	**g**	**h**	**t**	**u**	**v**
i	**r**	**u**	**s**	**t**	**w**	**a**	**q**	**u**	**a**

1._____ 6._____ 11._____

2._____ 7._____ 12._____

3._____ 8._____ 13._____

4._____ 9._____ 14._____

5._____ 10._____ 15._____

4. Speaking. Make a presentation on the following topic.

Unit 3. WATER SUPPLY

Project. Using information from the Appendix and sources of the Internet make up a presentation and speak about the evolution and development of water treatment methods and techniques.

Text 3A

1. Before you start.

- What is water supply system and what are its functions?
- Who designs water supply system?
- What knowledge is necessary for a proper design of water supply system?

2. Read the words and learn them by heart. Make up your own sentences with them.

1. **Water supply** – водоснабжение
2. **To provide** – обеспечивать
3. **Drainage** – канализация, сток
4. **Basin** – резервуар, водоем
5. **Raw water** – вода для промышленных нужд, неочищенная вода, сырая вода
6. **To accumulate** – накапливаться, скапливать
7. **Aquifer** – водонапорный бассейн, водоносный коллектор
8. **Pipe** – трубопровод, труба
9. **Water tank** – резервуар, водоцистерна, бак для воды
10. **Pressure vessel** – резервуар высокого давления, напорный сосуд
11. **Pump** – насос

12. **Outlet** – сток, выход, проход

13. **Impractical** – непроходимый

14. **Sewer** – канализационная труба, коллектор

15. **Ditch** – канава, траншея, котлован

16. **Downstream** – находящийся ниже по течению

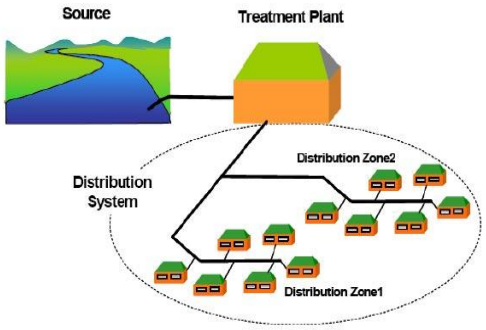
3. Read the text 3A, translate it and compare your ideas in ex.1 with the facts.

Water Supply Network

A **water supply system** or **water supply network** is a system of engineered hydrologic and hydraulic components which provide water supply.

A water supply system typically includes:

1. A drainage basin.
2. A raw water collection point (above or below ground) where the water accumulates, such as a lake, a river, or groundwater from an underground aquifer. Raw water may be transferred using uncovered ground-level aqueducts, covered tunnels or underground water pipes to water purification facilities.



Source: www.mfe.govt.nz

3. Water purification facilities. Treated water is transferred using water pipes (usually underground).
4. Water storage facilities such as reservoirs, water tanks, or water towers. Smaller water systems may store the water in cisterns or pressure vessels. Tall buildings may also need to store water locally in pressure vessels in order for the water to reach the upper floors.
5. Additional water pressurizing components such as pumping stations may need to be situated at the outlet of underground or above ground reservoirs or cisterns (if gravity flow is impractical).

6. A pipe network for distribution of water to the consumers (which may be private houses or industrial, commercial or institution establishments) and other usage points (such as fire hydrants).

7. Connections to the sewers (underground pipes, or aboveground ditches in some developing countries) are generally found downstream of the water consumers, but the sewer system is considered to be a separate system, rather than part of the water supply system.

(Source: http://en.wikipedia.org/wiki/Water_supply_network)

4. Answer the following questions.

1. Define water supply system.
2. What does water supply system include?
3. What is raw water collection point?
4. How may raw water be transferred?
5. How is treated water transferred?
6. What do water storage facilities include?
7. What is the function of pressure vessels?
8. Where are connections to the sewers generally found?

5. Using vocabulary in ex.2 match the words with their definitions.

Word	Definition
1. pipe	**a.** to give sth. to smb. or make it available for them to use.
2. drainage	**b.** an underground pipe that is used to carry sewage away from houses, factories, etc.
3. to provide	**c.** a machine that is used to force liquid, gas or air into or out of sth.
4. tank	**d.** a long channel dug at the side of a field or road, to hold or take away water.
5. pump	**e.** a tube through which liquids and gases can flow.
6. sewer	**f.** a large container for holding liquid or gas.
7. ditch	**g.** the process by which water or liquid waste is drained from an area.

6. Give English equivalents of the following words and word combinations from Text 3A.

Система водоснабжения, вода для промышленных нужд, гидравлическая деталь, подземный водонапорный бассейн, приборы очистки воды, очищенная вода, водохранилище, резервуар высокого давления, насосная станция, безнапорный поток.

7. Find definitions of the following physical forces and represent them by diagrams.

Bending	Centrifugal	Compression	Contraction
Expansion	Friction	Pressure	Shear
Tension		Torsion/torque	

8. Draw a water supply system scheme and describe it to your groupmates. Discuss your projects.

9. Read and find Russian equivalents to the following English proverbs and sayings. Express your thoughts on these topics and explain the meaning of them.

- Small rain lays great dust.
- Rain at seven, fine at eleven.
- To rain cats and dogs.
- Water of life.
- We never know the value of water till the well is dry.

Source: http://wastetimepost.com

Text 3B

1. Before you start.

- What qualities should water in the tap have?
- How can you recognize that water in the tap is not safe for drinking?

2. Read the words and learn them by heart. Make up your own sentences with them.

1. **To achieve** – достигать, соответствовать
2. **Gravity feed** – гравитационная подача, подача посредством силы тяжести, подача самотёком
3. **Elevation** – приподнятость, возвышение
4. **Pressurized** – находящийся под давлением, герметизированный
5. **Reserve** – водохранилище
6. **Pressure vessel –** резервуар высокого давления
7. **To eliminate** – устранять, исключать, уничтожать
8. **To maintain** – содержать, эксплуатировать
9. **Public entity** – бюджетная структура, публичная компания
10. **Master-plan** – генеральный план, план комплексного развития
11. **To design** – проектировать, конструировать
12. **Leakage** – протекание, просачивание
13. **To degrade** – ухудшаться, снижать качество
14. **Unlined** – незакрепленный, необделанный
15. **Copper** – медь
16. **Lead** – свинец
17. **Solder** – паяльник, сварка; спаянность
18. **Fixture** – крепление, фиксатор
19. **Tap** – водопроводный кран
20. **Booster station** – насосно-компрессорная станция

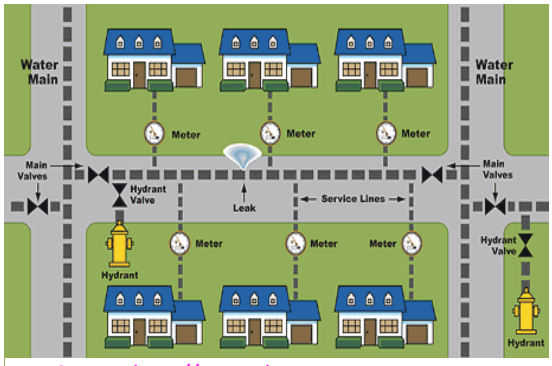
3. Read the text 3B, translate it and compare your ideas in ex.1 with the facts.

Water Distribution Network

The product, delivered to the point of consumption, is called fresh water if it receives little or no treatment, or drinking water if the treatment achieves the water quality standards required for human consumption. The energy that the system needs to deliver the water is called pressure. That energy is transferred to the water, therefore becoming water pressure, in a number of ways: by a pump, by gravity feed from a water source (such as a water tower) at a higher elevation, or by compressed air.

The water is often transferred from a water reserve such as a large communal reservoir before being transported to a more pressurized reserve such as a water tower. In small domestic systems, the water may be pressurized by a pressure vessel or even by an underground cistern (the latter however does need additional pressurizing). This eliminates the need of a water-tower or any other heightened water reserve to supply the water pressure.

These systems are usually owned and maintained by local governments, such as cities, or other public entities, but are occasionally operated by a commercial enterprise.



Source: http://www.thewatertreatments.com

Water supply networks are part of the master planning of communities, counties, and municipalities. Their planning and design requires the expertise of city planners and civil engineers, who must consider many factors, such as location, current demand, future growth, leakage, pressure, pipe size, pressure loss, fire fighting flows, etc. – using pipe network analysis and other tools.

As water passes through the distribution system, the water quality can degrade by chemical reactions and biological processes. Corrosion of metal pipe materials in the distribution system can cause the release of metals into the water with undesirable aesthetic and health effects. Release of iron from unlined iron pipes can result in customer reports of "red water" at the tap. Release of copper from copper pipes can result in customer reports of "blue water" and/or a metallic taste. Release of lead can occur from the solder used to join copper pipe together or from brass fixtures. Copper and lead levels at the consumer's tap are regulated to protect consumer health.

Corrosion inhibitors are often added to reduce release of metals into the water. Common corrosion inhibitors added to the water are phosphates and silicates.

Maintenance of a biologically safe drinking water is another goal in water distribution. Typically, a chlorine based disinfectant, such as sodium hypochlorite or monochloramine is added to the water as it leaves the treatment plant. Booster stations can be placed within the distribution system to ensure that all areas of the distribution system have adequate sustained levels of disinfection.

(Source: http://en.wikipedia.org/wiki/Water_supply_network)

4. Say if the sentences concerning Text 3B are true or false.

1. The product, delivered to the point of consumption, is called raw water.
2. If the treatment achieves the water quality standards required for human consumption the water is called drinking.
3. The energy that the system needs to deliver the water is called force.
4. In small domestic systems, the water may be pressurized by a pressure vessel or by an underground cistern.
5. Water supply systems are usually owned and maintained by private entrepreneurs.
6. Water supply networks are part of the master planning of communities, counties, and municipalities.
7. Pipe material does not influence water quality.
8. Common corrosion inhibitors added to the water are phosphates and silicates.

5. Answer the following questions.

1. What kind of water is called fresh?
2. Define drinking water.
3. What is pressure?
4. How is energy transferred to the water?
5. How may the water be pressurized in small domestic systems?
6. Who owns and maintains water supply systems?
7. What factors are taken into account when planning and designing water supply systems?
8. How does corrosion of metal pipe materials in the distribution system affect water quality?

9. What is often added to reduce release of metals into the water?
10. What common corrosion inhibitors do you know?

6. Give English equivalents of the following words and word combinations from Text 3B.

Сжатый воздух, гравитационная подача, запас воды, небольшие системы хозяйственного водоснабжения, бюджетная структура, коммерческое предприятие, сеть водоснабжения, генеральный план, противопожарный водоток, анализ системы водопровода, распределительная система, коррозия металлической трубы, выпадение металлов в воду.

7. Place the words from the word bank under the correct headings.

side oval corner polygon
diamond rectangle circle

Parts of a shape	Shapes with curved edges	Shapes with straight edges

8. Speaking. With a partner, act out the roles below.

Student A: You are a water supply engineer, who is designing a water supply system for a private house. Talk to Student B about:

- A project you are designing for him or her.
- Current measurements;
- Changes the client wants to make.

Student B: You are the client. Talk to Student A about changes you want to make to a project.

Final Tasks

1. Fill in the gaps using the words below:

Provides, pipes, water tanks, to leak, pumped, tap, drainage, ditch, chlorination, sewers

1. They installed new hot and cold water _____. 2. If there is any problem with _____ system in the house, you should call emergency service. 3. This company _____ a service for the public. 4. _____ are needed for water storage. 5. He _____ the tyres of his bicycle. 6. _____ are usually placed underground. 7. A long _____ was dug along the road. 8. Water had started _____ into the cellar. 9. Don't waste water! Turn the _____ off! 10. _____ is one of the most effective water treatment methods.

2. Translate the following sentences using the vocabulary of Unit 3.

1. Ухудшение качества воды ведет к возникновению различных проблем со здоровьем. 2. Эти трубы старые, пора заменить их. 3. Во время сильного дождя сточные канавы (drainage ditches) часто засоряются. 4. Снабжение горячей водой было приостановлено из-за аварии. 5. Сначала вода из реки поступает в специальный резервуар. 6. Насос часто используют для подкачки шин. 7. Рабочие вырыли траншею для установки канализационных труб. 8. Нам пришлось вызвать мастера, чтобы устранить протечку труб. 9. Мы установили хорошие фильтры. Ты можешь пить воду из под крана. 10. Сейчас все чаще используют пластиковые трубы. 11. Он установил дорогую систему водоснабжения в своем новом доме.

3. Speaking. Make a presentation on the following topics.

- History and development of water supply system.
- Scientists who contributed to the development of water supply system.

4. Compile as many words as you can with the letters of the word:

IMPERMEABILITY

5. Retell the following text about water resources using your active vocabulary.

К водным ресурсам относятся поверхностные и подземные воды, которые находятся в водных объектах и используются или могут быть использованы. В более широком смысле водные ресурсы – это воды в жидком, твёрдом и газообразном состоянии и их распределение на Земле.

Водные ресурсы – это все воды гидросферы, то есть воды рек, озёр, каналов, водохранилищ, морей и океанов, подземные воды, почвенная влага, вода горных и полярных ледников, водяные пары атмосферы.

Общий объем водных ресурсов составляет 1390 млн. км³, из них около 1340 млн. км³ – воды Мирового океана. Менее 3 % составляют пресные воды, из них технически доступны для использования всего 0,3 %. Крупнейшим потребителем воды является сельское хозяйство. Водные ресурсы считаются неисчерпаемыми, т.к. в настоящее время применяются технологии по опреснению соленых морских вод. Ежегодно, 22 марта, по решению ООН отмечается Всемирный день водных ресурсов.

(Source: https://ru.wikipedia.org)

Source: http://allpsdfile.com/earth-water-resour

Unit 4. WATER SEWERAGE SYSTEM

Text 4A

1. Before you start.

- What is water sewerage system?
- What is the function of water sewerage system?

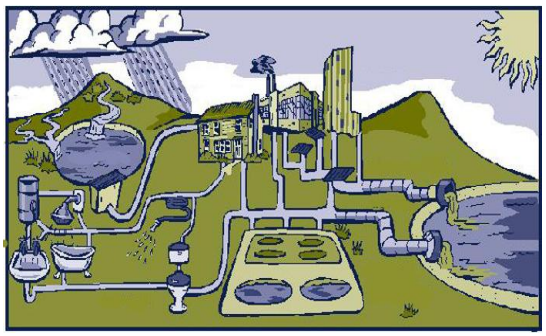
2. Read the words and learn them by heart. Make up your own sentences with them.

1. **Wastewater** – сточные воды
2. **Adversely** – неблагоприятно, отрицательно
3. **To convey** – транспортировать, передавать
4. **Combined sewer** – канализационный коллектор смешанного типа (для ливневых и коммунально-бытовых сточных вод)
5. **Sanitary sewer** – бытовая канализация, система канализации для бытовых сточных вод
6. **Wastewater treatment plant** – станция водоочистки, завод по очистке сточных вод
7. **To discharge** – спускать (напр., воду)
8. **Effluent** – жидкие промышленные отходы
9. **Drain field** – поле фильтрации
10. **Stormwater** – ливневая вода; ливнёвка
11. **To dispose of sth.** – уничтожать, избавиться, ликвидировать
12. **Cesspool emptier** – ассенизационная автоцистерна
13. **Manhole** – люк, смотровое отверстие
14. **Watershed** – водосборный бассейн
15. **Overarching** – главный, комплексный

3. Read the text 4A, translate it and compare your ideas in ex.1 with the facts.

Wastewater

Wastewater, also written as **waste water**, is any water that has been adversely affected in quality by anthropogenic influence. Municipal wastewater is usually conveyed in a combined sewer or sanitary sewer, and treated at a wastewater treatment plant. Treated wastewater is discharged into receiving water via an effluent sewer. Wastewaters generated in areas without access to centralized sewer systems rely on on-site wastewater systems. These typically comprise a septic tank, drain field, and optionally an on-site treatment unit. The management of wastewater belongs to the overarching term sanitation, just like the management of human excreta, solid waste and stormwater (drainage).



Source: http://ecohydroproject.ru

Sewage is the subset of wastewater that is contaminated with feces or urine, but is often used to mean any wastewater. Sewage includes domestic, municipal, or industrial liquid waste products disposed of, usually via a pipe or sewer (sanitary or combined), sometimes in a cesspool emptier.

Sewerage is the physical infrastructure, including pipes, pumps, screens, channels etc. used to convey sewage from its origin to the point of eventual treatment or disposal. It is found in all types of sewage treatment, with the exception of septic systems, which treat sewage on site.

Sewage disposal. In some urban areas, sewage is carried separately in sanitary sewers and runoff from streets is carried in storm drains. Access to either of these is typically through a manhole. During high precipitation periods a combined sewer overflow can occur, forcing untreated sewage to flow back into the environment. This can pose a serious threat to public health and the surrounding environment.

Sewage may drain directly into major watersheds with minimal or no treatment. When untreated, sewage can have serious impacts on the quality of an environment and on the health of people. Pathogens can cause a variety of illnesses. Some chemicals pose risks even at very low concentrations and can remain a threat for long periods of time because of bioaccumulation in animal or human tissue.

(Source: http://en.wikipedia.org/wiki/Sewage_treatment)

4. Say if the sentences concerning Text 4A are true or false.

1. Waste water is any water that has been used in vain.
2. Municipal wastewater is usually conveyed in an effluent sewer.
3. Wastewaters generated in areas without access to centralized sewer systems rely on on-site wastewater systems.
4. Sewerage is the physical infrastructure, including pipes, pumps, screens, channels etc.
5. When untreated, sewage does not have serious impacts on the quality of an environment and on the health of people.

5. Answer the following questions.

1. Give the definition of wastewater.
2. Where is wastewater usually conveyed and treated?
3. How is treated wastewater discharged into receiving water?
4. What do on-site wastewater systems typically comprise?
5. Who does management of wastewater belong to?
6. What is sewerage?
7. What can pose a serious threat to public health and the surrounding environment?

6. Give English equivalents of the following words and word combinations from Text 4A.

Завод по очистке сточных вод, отстойник, поля фильтрации, ассенизационная автоцистерна, блок очистки, коллектор для ливневых вод, обратный поток, может представлять серьезную угрозу, в периоды выпадения большого количества осадков, оказывать серьезное влияние на качество окружающей среды, водосборный бассейн, человеческая ткань.

7. Think of the situations where you can use the following idioms.

A diamond of the first water, (to go, to pour, to throw) down the drain, as dull as ditch-water, a fish out of water, flow like water, get into hot water, go (swim) against the current, go off the boil, milk and water, water under the bridge.

8. Complete the following table.

Verb	Noun	Adjective
provide		
	contractor	
		constructive
	decision	
build		
	inventor; invention	
		basic
		encouraging
substitute		
	pollution	

9. Speaking. Find additional material and discuss the following questions:

- Speak about water sewerage system.
- What is sewerage treatment plant?
- What is recycled water? How and in what countries is it used?

10. Retell the following English joke "Water in the Carburetor".

A wife comes home and tells her husband, "Dear, something is wrong with my car. It's got water in the carburetor."

The husband replies, "That's not possible."

"Well," says the wife, "I'm telling you that's the problem."

The husband gets up and sighs, "OK, fine. Where'd you park it?"

The wife points toward the backyard, "In the swimming pool."

Text 4B

1. Before you start.

- Why is it necessary to treat wastewater?
- Do you know any wastewater treatment techniques?

2. Read the words and learn them by heart. Make up your own sentences with them.

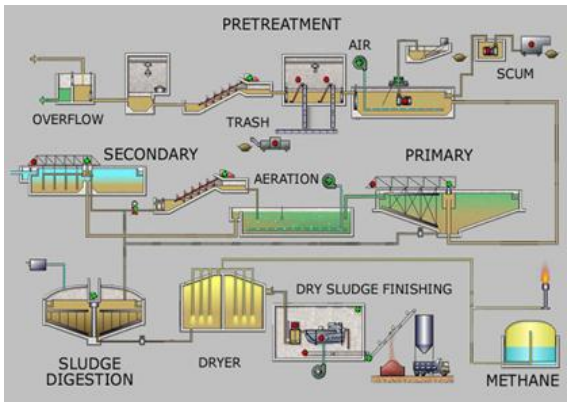
1. **Effluent** – сток, жидкие промышленные отходы
2. **To remove** – устранять, удалять
3. **Sludge** – грязь, слякоть
4. **Fertilizer** – удобрение
5. **Grey water** – бытовые сточные воды
6. **Black water** – бытовые и фекальные стоки
7. **To recycle** – перерабатывать (отходы), повторно использовать
8. **Flushing toilet** – туалет со сливом
9. **Stormwater runoff** – ливневый сток
10. **To overwhelm** – переполнять, заливать, захлестывать
11. **Spill** – выход воды из берегов, разлив
12. **Overflow** – переливание через край, наводнение
13. **Grease** – жир
14. **Discharge** – спуск, слив
15. **Retention basin** – накопительный резервуар
16. **Media filters** – фильтр грубой очистки с фильтрующим элементом
17. **Vortex separators** – вихревой сепаратор
18. **A quiescent basin** – успокоительная емкость
19. **Indigenous** – природный
20. **Lagoon** – пруд-отстойник, отстойный бассейн
21. **Wetland** – заболоченное место

3. Read the text 4B, translate it and compare your ideas in ex.1 with the facts.

Sewage Treatment

Sewage treatment is the process of removing contaminants from wastewater, including household sewage and runoff (effluents). It includes physical, chemical, and biological processes to remove physical, chemical and biological contaminants. Its objective is to produce an environmentally safe fluid waste stream (or treated effluent) and a solid waste (or treated sludge) suitable for disposal or reuse (usually as farm fertilizer).

Sewage is generated by residential, institutional, commercial and industrial establishments. It includes household waste liquid from toilets, baths, showers, kitchens, sinks and so forth that is disposed of via sewers. In many areas, sewage also includes liquid waste from industry and commerce. The separation and draining of household waste into greywater and blackwater is becoming more common in the developed world, with greywater being permitted to be used for watering plants or recycled for flushing toilets.



Source: http://en.wikipedia.org/

Sewage may include stormwater runoff. Sewerage systems capable of handling storm water are known as combined sewer systems. This design was common when urban sewerage systems were first developed, in the late 19th and early 20th centuries. Combined sewers require much larger and more expensive treatment facilities than sanitary sewers. Heavy volumes of storm runoff may overwhelm the sewage treatment system, causing a spill or overflow. Sanitary sewers are typically much smaller than combined sewers, and they are not designed to transport stormwater. Communities that have urbanized in the mid-20th century or later generally have built separate systems for sewage (sanitary sewers) and stormwater, because precipitation causes widely varying flows, reducing sewage treatment plant efficiency.

As rainfall travels over roofs and the ground, it may pick up various contaminants including soil particles and other sediment, heavy metals, organic compounds, animal waste, and oil and grease. Some jurisdictions require stormwater to receive some level of treatment before being discharged directly into waterways. Examples of treatment processes used for stormwater

include retention basins, wetlands, buried vaults with various kinds of media filters, and vortex separators (to remove coarse solids).

Sewage can be treated close to where the sewage is created, a decentralized system (in septic tanks, biofilters or aerobic treatment systems), or be collected and transported by a network of pipes and pump stations to a municipal treatment plant, a centralized system. Sewage collection and treatment is typically subject to local, state and federal regulations and standards. Industrial sources of sewage often require specialized treatment processes.

Sewage treatment generally involves three stages, called primary, secondary and tertiary treatment.

Primary treatment consists of temporarily holding the sewage in a quiescent basin where heavy solids can settle to the bottom while oil, grease and lighter solids float to the surface. The settled and floating materials are removed and the remaining liquid may be discharged or subjected to secondary treatment.

Secondary treatment removes dissolved and suspended biological matter. Secondary treatment is typically performed by indigenous, water-borne micro-organisms in a managed habitat. Secondary treatment may require a separation process to remove the micro-organisms from the treated water prior to discharge or tertiary treatment.

Tertiary treatment is sometimes defined as anything more than primary and secondary treatment in order to allow rejection into a highly sensitive or fragile ecosystem (estuaries, low-flow rivers, coral reefs). Treated water is sometimes disinfected chemically or physically (for example, by lagoons and microfiltration) prior to discharge into a stream, river, bay, lagoon or wetland, or it can be used for the irrigation. If it is sufficiently clean, it can also be used for groundwater recharge or agricultural purposes.

(Source: http://en.wikipedia.org/wiki/Sewage_treatment)

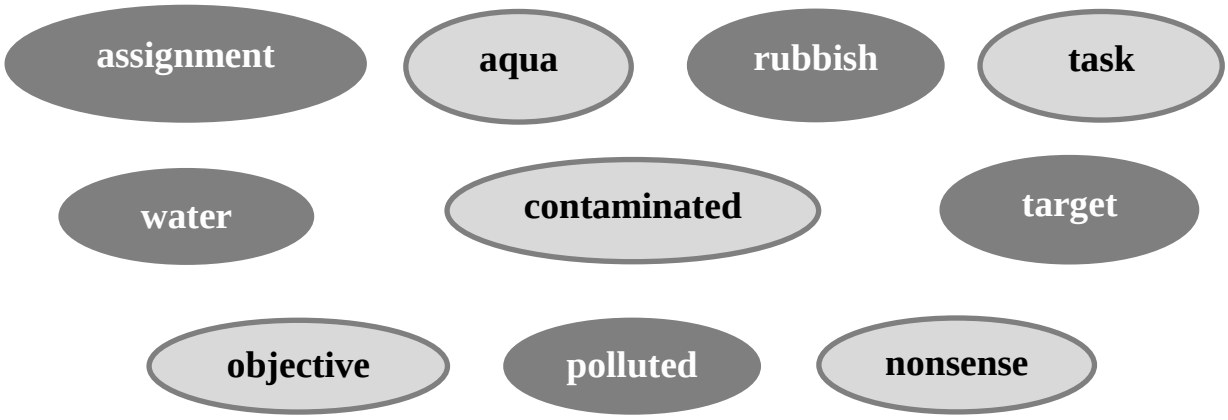
4. Say if the sentences concerning Text 4B are true or false.

1. Sewage treatment is the process of removing contaminants from wastewater.
2. Sewage is generated only by residential establishments.
3. Greywater may be used for watering plants or recycled for flushing toilets.
4. Sanitary sewers require much larger and more expensive treatment facilities than combined sewers.
5. Sanitary sewers are typically much larger than combined sewers, and they are capable of transporting stormwater.

5. Answer the following questions.

1. Define the process of sewage treatment.
2. What types of contaminants does it remove?
3. What is its main objective?
4. What are combined sewer systems?
5. What is the difference between combined sewers and sanitary sewers?
6. What is a centralized system of sewage treatment?
7. How does decentralized system function?
8. What are the three stages that sewage treatment involve? Describe each of them.

6. Match the following words with their synonyms.



7. Retell the following text in English.

Первые упоминания о водопроводе можно найти еще в Библии в Книге Царств с I тыс. до н.э. В Древнем Риме водопроводы называли акведуками. Первые водопроводные системы на территории России появились в Болгаре. В XI или начале XII века первый водопровод из деревянных труб появился на Ярославском дворище в Новгороде. Московский кремль имел водопровод с XV века. Первая городская

водопроводная система в Москве появилась в 1804 году. В качестве материала для водопровода использовали глину, древесину, медь, свинец, железо, сталь, а с развитием органической химии стали применять и полимеры. Трубопроводы больших диаметров также изготавливали из цемента, железобетона, асбестоцемента, а в последние годы и из различных видов пластика. В наше время все большее распространение получают полимерные трубопроводы из-за простоты их монтажа и дешевизны продукции, поступающей из развивающихся стран.

(Source: https://ru.wikipedia.org)

8. Discuss the following topics and make up the report. Use the sources of the Internet to help you.

- Speak about sewage treatment in different countries (developed and developing ones).
- Speak about the history of water sanitation.

Final Tasks

1. Make up questions to the following sentences.

1. Our family consumes 16m³ of water every month. (*Who? What? How often?*)
2. You can't swim in this lake, it is contaminated with bacteria! (*Where? What with? Why?*)
3. Several species of fish died because the oil-tanker had spilt oil in the river. (*Who? Why? What?*)
4. Last year they installed a new system of water supply in their country house. (*Who? When? Where?*)
5. Every year volunteers save thousands of animals who suffer from water pollution. (*Who? What? How many? Why?*)
6. Man should drink no less than two litres of water every day. (*Who? What? How many? How often?*)

7. A new water treatment plant was built last year in our city. (*What? When? Where?*)
8. Every morning she drinks a glass of fresh water. (*Who? When? What?*)
9. This bottle of water is just from the fridge, I can't drink it. (*Where? What? Why?*)
10. This tap is old, you need to replace it as soon as possible. (*Who? What? Why? When?*)

2. Translate the following sentences from Russian into English.

1. Проблема обеспеченности водой – важная проблема для многих стран мира. 2. Сельское хозяйство без воды существовать не может. 3. В нашей стране проблема распределения водных ресурсов стала одной из главных. 4. Раздел гидрологии океанология изучает характеристики больших масс воды. 5. Острая нехватка чистой питьевой воды в некоторых странах приводит к частым вспышкам кишечно-инфекционных заболеваний. 6. Морская вода непригодна для питья, так как в ней содержится большое количество минералов. 7. После опреснения морскую воду можно пить. 8. В Гонконге морская вода широко используется в сливных системах туалетов в целях экономии пресной воды.

3. Discuss the following questions.

Consequences of water pollution.	What sanitation technologies are applied nowadays?	What is a flush toilet with a conservancy tank and how does it work?
What is a flush toilet with septic tank and soakaway?	What is a twin pit composting toilet?	What technologies for the control of water supply are used in your country?

Unit 5. HVAC. GENERAL INFORMATION

How does water payment system look like in your country?	What is pumping system? Where can pump drivers be found?

Text 5A

1. Before you start.

- What is HVAC? What do letters in this abbreviation mean?
- Why did you decide to become a HVAC-engineer?
- What construction stage is HVAC system built on?

2. Read the words and learn them by heart. Make up your own sentences with them.

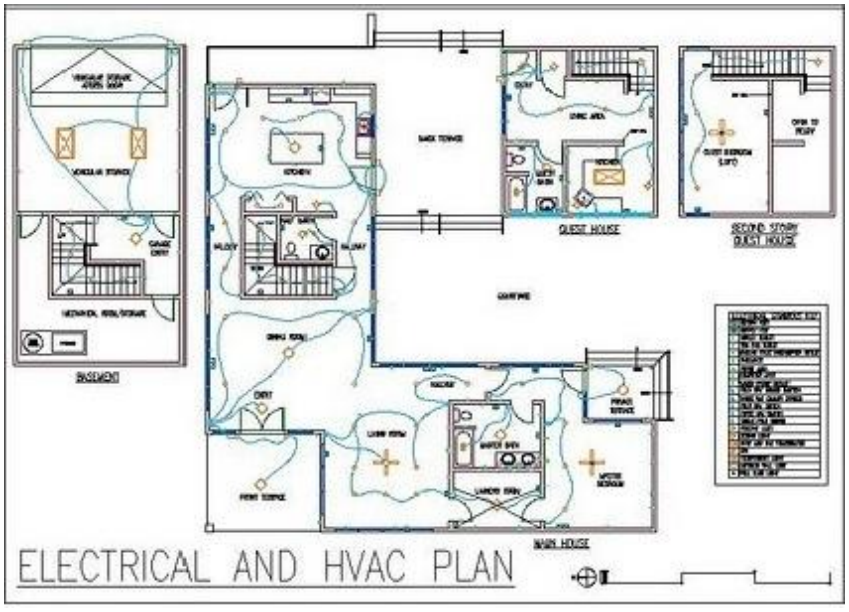
1. **Heating** – отопление, нагревание
2. **Ventilation** – вентиляция, движение воздуха
3. **Air conditioning** – кондиционирование воздуха
4. **Vehicular** – относящийся к средствам передвижения; *зд.* при эксплуатации автотранспорта
5. **Acceptable** – приемлемый, допустимый
6. **Fluid mechanics** – гидроаэромеханика, механика жидкости и газа
7. **To transfer** – перемещать, передавать
8. **Refrigeration** – система охлаждения
9. **Humidity** – влажность
10. **With respect to** – с учетом, в соответствии с
11. **Consumer** – потребитель, потребитель энергии
12. **Maintenance** – техническое обслуживание

13. **Adherence** – строгое соблюдение (норм, принципов)
14. **To regulate** – регулировать, упорядочить
15. **Interrelated** – взаимосвязанный
16. **Installation** – установка, сборка
17. **Energy efficiency** – энергоэффективность, энергосбережение

3. Read the text 5A, translate it and compare your ideas in ex.1 with the facts.

HVAC

HVAC (heating, ventilation, and air conditioning) is the technology of indoor and vehicular environmental comfort. Its goal is to provide thermal comfort and acceptable indoor air quality. HVAC system design is a subdiscipline of mechanical engineering, based on the principles of thermodynamics, fluid mechanics, and heat transfer. Refrigeration is sometimes added to the field's abbreviation as HVAC&R or HVACR, or ventilating is dropped as in HACR.



Source: https://www.flickr.com

HVAC is important in the design of medium to large industrial and office buildings such as skyscrapers and in marine environments such as aquariums, where safe and healthy building conditions are regulated with respect to temperature and humidity, using fresh air from outdoors.

The main purposes of a HVAC system are to help maintain good indoor air quality through adequate ventilation with filtration and provide thermal comfort. HVAC systems are among the largest energy consumers in buildings. The choice and design of the HVAC system can also affect many other high performance goals, including water consumption (water cooled air conditioning equipment) and acoustics.

The three central functions of heating, ventilation, and air-conditioning are interrelated, especially with the need to provide thermal comfort and acceptable indoor air quality within reasonable installation, operation, and maintenance costs. HVAC systems can provide ventilation, reduce air infiltration, and maintain pressure relationships between spaces.

A modern quality HVAC system should provide an appropriate quantity and quality of outdoor air, lower energy costs, and easier maintenance.

In most developed countries climatic conditions require that outdoor air must be heated and cooled to provide acceptable thermal comfort for building occupants, requiring the addition of HVAC systems. The selection of equipment for heating, cooling and ventilating the building is a complex design decision that must balance a great many factors, including heating and cooling needs, energy efficiency, humidity control, potential for natural ventilation, adherence to codes and standards, outdoor air quantity and quality, indoor air quality, and cost.

(Sources: http://en.wikipedia.org/wiki/HVAC, http://www.epa.gov/)

4. Say if the sentences concerning Text 5A are true or false.

1. HVAC is the technology of outdoor comfort.
2. The goal of HVAC is to provide thermal comfort and acceptable indoor air quality.
3. HVAC systems consume rather little amount of energy in buildings.
4. HVAC systems can provide ventilation, reduce air infiltration, and maintain pressure relationships between spaces.
5. A modern quality HVAC system should provide an appropriate quantity and quality of indoor air.
6. Equipment for heating, cooling and ventilating the building must be adherent to codes and standards.

5. Answer the following questions.

1. How is abbreviation HVAC deciphered?
2. What is the goal of HVAC system?
3. What principles is HVAC system design based on?
4. What is the fourth component that is sometimes added to HVAC abbreviation?
5. What are the main purposes of a HVAC system?
6. What are the three central functions of heating, ventilation, and air-conditioning?
7. What should a modern quality HVAC system provide?
8. What factors are taken into account in selection of equipment for heating, cooling and ventilating the building?

6. Using vocabulary in ex.2 match the words with their definitions.

Word	Definition
1. heating	**a.** located, done or used inside a building.
2. ventilation	**b.** the process of removing heat from an enclosed space or from a substance for the purpose of lowering the temperature.
3. air conditioning	**c.** the state of having a pleasant life, with everything that you need.
4. indoor	**d.** The act or process of infiltrating.
5. outdoor	**e.** connected with heat.
6. refrigeration	**f.** a system that cools and dries the air in a building or car.
7. environment	**g.** used, happening or located outside rather than in a building.
8. infiltration	**h.** the process of supplying heat to a room or building.
9. thermal	**i.** the natural world in which people, animals and plants live.
10. comfort	**j.** the process allowing fresh air to enter and move around a room, building, etc.

7. Give English equivalents of the following words and word combinations from Text 5A.

Комфортность окружающей среды при эксплуатации автотранспорта, приемлемое качество воздуха в помещении, инженерная механика, передача тепла, высокие

эксплуатационные характеристики, эксплуатационные расходы, устанавливать вентиляцию, сокращение инфильтрации воздуха, атмосферный воздух (наружный воздух), энергосберегающий, контроль влажности, соответствие кодам и стандартам.

8. Put the words from the text in the correct order to make up sentences.

1. Comfort, indoor, the, HVAC, and, environmental, vehicular, is, of, technology.
2. Air, acceptable, HVAC, comfort, provides, thermal, quality, system, and, indoor.
3. In, largest, buildings, energy, among, consumers, systems, the, HVAC, are.
4. Infiltration, provide, air, ventilation, and, systems, HVAC, reduce.
5. Standards, and, to, HVAC, equipment, must, be, codes, adherent, systems.

9. Speaking.

- How can HVAC system in an individual building differ from that in a multi-storeyed building (in an industrial building)?
- Draw the plan and discuss it with your groupmates.

Text 5B

1. Before you start.

- What equipment is necessary for the installation of a HVAC system?
- Where can you get proper knowledge to become a good HVAC specialist?

2. Read the words and learn them by heart. Make up your own sentences with them.

1. **Fan** – вентилятор
2. **To circulate** – циркулировать, распространяться
3. **Ductwork** – трубопровод, сеть вентиляционных труб
4. **Device** – устройство, механизм, аппарат
5. **Outlet** – выход, концевой (выходной) участок трубопровода

6. **Inlet** – вход, входное отверстие
7. **Plenum** – баллон, камера давления, нагнетатель, система вентиляции; вентиляционная камера, пространство здания для систем кондиционирования воздуха
8. **Opening** – отверстие, щель
9. **Louver** – вентиляционная прорезь, решетка
10. **Mixed air chamber** – камера смешанного воздуха
11. **To remove** – перемещать, удалять, устранять
12. **Heat exchanger** – теплообменное устройство
13. **Coil** – змеевик, проволочная спираль
14. **Refrigerant evaporator** – испаритель холодильного агента
15. **Auxiliary** – дополнительный, вспомогательный
16. **Furnace** – котел, печь (техническая)
17. **To pump** – качать, работать насосом
18. **To condense** – конденсировать, охлаждать

3. Read the text 5B, translate it and compare your ideas in ex.1 with the facts.

HVAC System Components

The basic components in a common central HVAC system as illustrated in Figure 5.1 are:

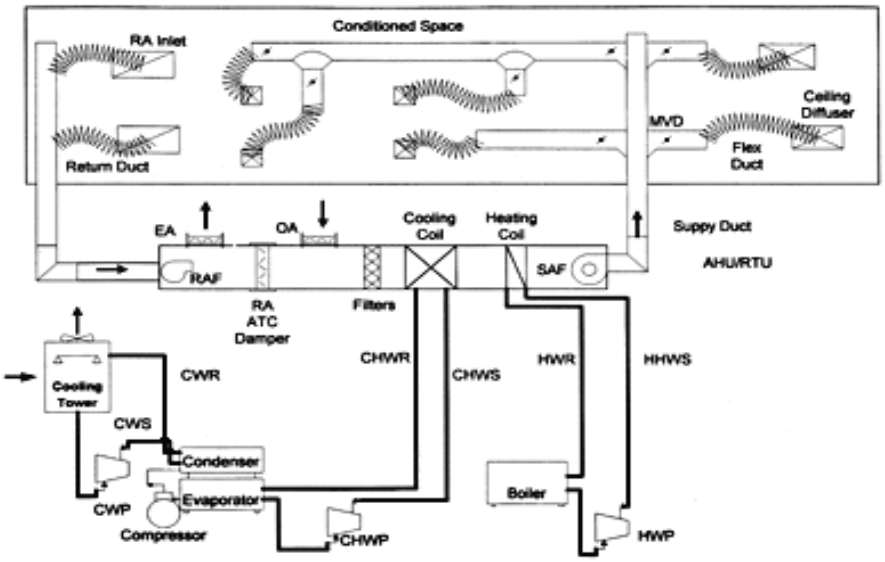


Figure 5.1. HVAC system components.

- Fan(s) to circulate the supply air (SA) and return air (RA).
- Supply air ductwork in which the air flows from the supply fan to the conditioned space.
- Air devices such as supply air outlets and return air inlets.
- Return air path or ductwork in which the air flows back from the conditioned space to the mixed air chamber (plenum).
- Outside air (OA) device such as an opening, louver or duct to allow for the entrance of outside air into the mixed air chamber.
- Mixed air chamber to receive the return air and mix it with outside air.
- Filter section(s) to remove dirt and dust particles from the mixed air.
- Heat exchanger(s) such as hot water coil(s), steam coil(s), refrigerant evaporator(s), or chilled water coil(s) to add heat to or remove heat from the circulated air.
- Auxiliary heating devices such as natural gas furnace(s) or electric heating element(s).
- Compressor(s) to compress the refrigerant vapor and pump the refrigerant around the system.
- Condenser(s) to remove heat from the refrigerant vapor and condense it to a liquid.
- Fan(s) to circulate outside air across air-cooled condenser(s)
- Pump(s) to circulate water through water-cooled condenser(s); condenser water pump (CWP); and condenser water supply (CWS) and return (CWR).
- Pump(s) to circulate hot water from the boiler(s) through the hot water coil(s) and back or to circulate chilled water from the chiller(s) through the chilled water coil(s) and back to the chiller(s).
- For central systems, water or steam boiler(s) as a central heating source.
- For central systems, water chiller(s) as a central cooling source.
- For central systems, cooling tower(s) with water-cooled condenser(s).
- Controls to start, stop, or regulate the flow of air, water, steam, refrigerant and electricity.

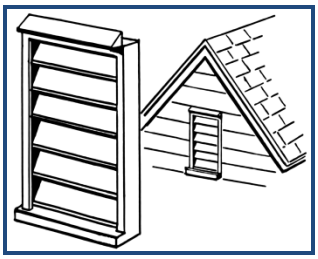
(Source: http://www.edcmag.com)

4. Answer the following questions.

1. Why are fans needed?
2. What is the function of a supply air ductwork?
3. What air devices do you know?

4. What is plenum?
5. What do filter sections do?
6. Give examples of heat exchangers.
7. What are the functions of a compressor and a condenser?
8. How are pumps used?
9. What are control devices necessary for?

5. Match the pictures with suitable words.

1. 
2. 
3. 
4. 
5. 
6. 

a. fan__ **b.** valve__ **c.** pipe__
d. coil__ **e.** pump__ **f.** louver__

6. Give English equivalents of the following words and word combinations from Text 5B.

Поступающий воздух, рециркуляционный воздух, приточный вентилятор, кондиционируемое пространство, воздушное устройство, смешанный воздух, атмосферный воздух, звено фильтра, теплообменник, пар холодильного агента, конденсаторная вода, основной источник тепла, охлаждающая камера, поток воздуха.

7. Using vocabulary in ex.2 match the words with their definitions.

Word	Definition
1. louver	**a.** a series of circles formed by winding up a length of rope, wire, etc.
2. pump	**b.** a tube through which liquids and gases can flow.
3. coil	**c.** a machine used for making air or water warmer.
4. valve	**d.** a machine with blades that go round to create a current of air.
5. pipe	**e.** one of a set of narrow strips of wood, plastic, etc. in a door or a window that are designed to let air and some light in, but to keep out strong light or rain.
6. fan	**f.** a pipe or tube carrying liquid, gas, electric or telephone wires, etc.
7. heater	**g.** a device for controlling the flow of a liquid or gas, letting it move in one direction only.
8. duct	**h.** a machine that is used to force liquid, gas or air into or out of sth.

8. Speaking.

Speak about Nikolay Lvov, Michael Faraday, Willis Carrier Reuben Trane, James Joule, William Rankine, Sadj Carnot, who contributed to the development of HVAC systems, or about the great inventions of these people.

Final Tasks

1. Fill in the gaps using the words below:

Pumping, vent, pipe, thermal, duct, heater, ventilation, indoor, valve, fan

1. The engine is used for _____ water out of the well. 2. Turn the _____ off to prevent the gas leak. 3. A leaking gas _____ is very dangerous and can cause much trouble. 4. Switch on the electric _____. It is very hot here. 5. If it is cold in the room, you can make the space warm by an oil _____. 6. Every building has got a _____ duct. 7. The _____ may be constructed either underground or over the ground. 8. They have got a very big house, there is even an _____ swimming pool there. 9. _____ underwear will warm you in cold weather in winter. 10. An opening that allows air to pass out of or into a room is called an air _____.

2. Translate the following sentences from Russian into English.

1. Дай мне, пожалуйста, моток проволоки (wire coil), и я починю это устройство. 2. Эти вентили старые, пора их заменить. 3. Сейчас все чаще устанавливают пластиковые трубы. 4. Летом вентилятор спасает от духоты. 5. Мы установили водонагреватель в ванной комнате. 6. Термальные источники привлекают большое количество туристов в эту страну. 7. Вентиляционная решетка на кухне грязная, пора ее помыть. 8. На даче мы используем газовый нагреватель. 9. В этом месяце мы получили большие счета за отопление (heating bills). 10. Убедись, что в комнате хорошая вентиляция, прежде чем использовать эту краску. 11. Выключи, пожалуйста, кондиционер, стало очень холодно.

3. Speaking.

Speak about the history of the development of HVAC system. Make up a report and presentation.

4. Match the sensor or measuring system (1-5) to the industrial applications (a-e).

Measuring system	The Industrial Applications
1 pressure measurement	**a** monitoring the speed of water travelling along a supply pipe
2 temperature measurement	**b** measuring the level of heat generated by an exothermic reaction
3 flow measurement	**c** monitoring the number of cans moving along a conveyor belt
4 level measurement	**d** monitoring the amount of ethanol contained in a storage tank
5 process recorders	**e** checking the force exerted by steam inside a vessel

5. Think of the situations where you can use the following idioms.

Bring smth. to light, build bridges, come to light, drive smb. up the wall, drop a brick, drop smb.(smth.) like a hot brick, give a green light to smb., go out like a light, guiding light, as hard as iron, as hard as steel, as hard as stone, strike while the iron is hot.

6. Retell the following English joke.

Fixing Fences

Three contractors were touring the White House on the same day. One was from New York, another from Missouri, and the third from Florida. At the end of the tour, the guard asked them what they did for a living. When they each replied that they were contractors, the guard said, "Hey we need one of the rear fences redone. Why don't you guys take a look at it and give me your bids."

First the Florida contractor took out his tape measure and pencil, did some measuring and said, "I figure the job will run about $900–$400 for materials, $400 for my crew, and $100 profit for me."

Next was the Missouri contractor. He also took out his tape measure and pencil, did some quick calculations and said, "Looks like I can do this job for $700 – $300 for materials, $300 for my crew, and $100 profit for me."

Finally, the guard asks the New York contractor for his bid. Without batting an eye, the contractor says, "$2,700."

The guard, incredulous, looks at him and says, "You didn't even measure like the other guys! How did you come up with such a high figure?"

"Easy," says the contractor from New York, "$1,000 for me, $1,000 for you, and we hire the guy from Missouri."

(Source: http://www.topfloorstore.com/doodads_h/jokes.shtml)

Unit 6. GAS SUPPLY

Text 6A

1. Before you start.

- How do we use gas in our everyday life?
- What is natural gas?
- What are the properties of gas?

2. Read the words and learn them by heart. Make up your own sentences with them.

1. **Gas supply** – газоснабжение, газификация
2. **Fuel** – топливо, горючее вещество
3. **To reprocess** – перерабатывать, подвергать вторичной обработке
4. **Heat-treatment furnace** – нагревательная печь, термическая печь
5. **Natural gasoline** – бензин из природного газа, газовый бензин
6. **Oil refinery** – нефтеперерабатывающий завод
7. **By-product gas** – побочный газ
8. **Steam power plant** – теплоэлектростанция
9. **Complete** – функциональный
10. **Raw material** – сырьё
11. **Main gas pipeline** – магистральный газопровод
12. **Extraction** – добывание, извлечение
13. **To permit** – разрешать, давать возможность
14. **To feed** – подавать, нагнетать; снабжать топливом
15. **Vessel** – судно, корабль
16. **Dependable** – зависящий от конкретных условий работы
17. **Gas unit** – газобензиновая установка

3. Read the text 6A, translate it and compare your ideas in ex.1 with the facts.

Gas Supply

Gas supply is the organized delivery and distribution of gas fuel to serve the needs of the national economy. The following gases are supplied: natural gas fuels, manufactured gases produced during the thermal reprocessing of solid and liquid fuels in gas generators and heat-treatment furnaces, and liquefied gases produced at natural-gasoline and oil refineries during the refining of petroleum and by-product gases. Natural gas is a very complete and economical type of fuel and is a valuable raw material for the chemical industry.

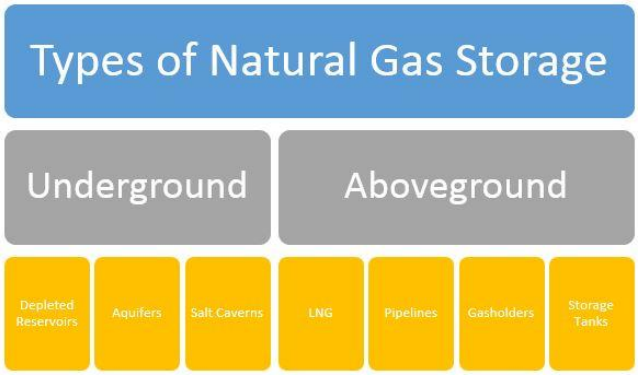
Source: http://azh.kz/

The largest users of natural gas are steam power plants and enterprises of various industrial sectors (such as machine building, ferrous and nonferrous metallurgy, and the building materials industry). In the municipal economy, gas is used for cooking food (in residential buildings and public catering establishments), for the technical needs of municipal-utility service enterprises, for the heating of water to be used for municipal-utility and sanitary-hygienic purposes, and for the heating, ventilating, and air conditioning of residential and public buildings.

Cities and industrial enterprises are supplied with natural and artificial gases by main gas pipelines, which transport the gas from the locations of its extraction or production to the consumers. The delivery of gas to a populated area or an industrial location takes place at a distribution control point, where the gas pressure is reduced to a level permitted by the appropriate standards, and the gas is then fed into the municipal gas distribution system or to an industrial enterprise.

Gas supply systems may be either centralized or decentralized. In centralized systems, gas is distributed to consumers by a municipal gas distribution system; in decentralized systems, it is distributed from local gas-generating plants or through the use of vessels (tanks or cylinders) filled with liquefied gas. Local systems are commonly used to supply gas to residential buildings and municipal-utility enterprises in small towns and settlements, especially those located at considerable distances from main gas pipelines.

Liquefied gases are transported from natural-gasoline refineries to consumers by means of pipelines, railroad tank cars, tank trucks, and cylinders; special ships, called gas tankers, have been developed for transporting liquefied gases by sea. Liquefied gas is delivered over long distances mainly by railroad tank cars.



Source: www.technavio.com

Underground gas storage reservoirs are created near large cities for dependable operation of the gas supply system.

Low-rise residential buildings and small municipal enterprises are usually supplied with gas from gas cylinder installations consisting of one or two liquefied-gas cylinders, a pressure regulator, and gas units and appliances (stove or water heater). Installations with one cylinder are placed in the same location as the gas device or appliance they serve; two-cylinder units are installed in a metal cabinet located on a wall on the outside of the building. Multistory buildings are supplied with gas from grouped gas-cylinder installations and installations consisting of underground tanks. Gas is delivered to the gas appliances in buildings by gas piping systems similar to those used for supplying natural gas.

(Source: http://encyclopedia2.thefreedictionary.com/plants)

4. Say if the sentences concerning Text 6A are true or false.

1. Natural gas is a very wasteful type of fuel.
2. The largest users of natural gas are ordinary people.
3. In the municipal economy, gas is used for the heating, ventilating, and air conditioning of residential and public buildings.
4. Main gas pipelines transport the gas from the locations of its extraction or production to the consumers.
5. Gas supply systems may be only centralized.
6. Low-rise residential buildings and small municipal enterprises are usually supplied with gas from gas cylinder installations.

5. Answer the following questions.

1. What is gas supply?
2. What kinds of gas are supplied?
3. What characteristics does natural gas have?
4. Who are the largest users of natural gas?
5. How gas is used in the municipal economy?
6. How are cities and industrial enterprises supplied with natural and artificial gases?
7. How does the delivery of gas to a populated area or an industrial location take place?
8. What types of gas supply systems do you know? Describe them.
9. How are gases transported?
10. How are usually low-rise residential buildings and small municipal enterprises supplied with gas?

6. Using vocabulary in ex.2 match the words with their definitions.

Word	Definition
1. natural gas	**a.** any material that produces heat or power, usually when it is burnt.
2. fuel	**b.** a thick liquid that is found in rock underground.
3. to reprocess	**c.** to make a substance pure by taking other substances out of it.
4. oil	**d.** a device for controlling the flow of a liquid or gas, letting it move in one direction.
5. extraction	**e.** gas that is found under the ground or the sea and that is used as a fuel.
6. vessel	**f.** the act or process of removing or obtaining sth. from sth. else.
7. to refine	**g.** to subject to a special process or treatment in preparation for reuse.
8. furnace	**h.** in its natural state; not yet changed, used or made into smth. else.
9. valve	**i.** a space surrounded on all sides by walls and a roof for heating metal or glass to very high temperatures.
10. raw materials	**j.** a large ship or boat.

7. Give English equivalents of the following words and word combinations from Text 6A.

Топливо на основе природного газа, коммунально-бытовой газ (искусственный газ), термальная переработка, твердое и жидкое топливо, газовый генератор, ценное сырье, химическая промышленность, машиностроение, черная и цветная металлургия, производство строительных материалов, городское хозяйство, предприятия общественного питания, пункт управления распределением, газогенераторная установка, надежная работа.

8. Discuss with the group the following topics:

- What countries are rich in gas?
- Why is natural gas also called blue-sky fuel?
- What is natural gas and artificial (manufactured) gas?
- Think of five things we use gas for.
- What do you think is more convenient, gas or electric cooking?

Text 6B

1. Before you start.

- What are building services systems?
- Where and how gas tubes may be built?

2. Read the words and learn them by heart. Make up your own sentences with them.

1. **Bulk** – основная масса, большое количество
2. **Demand** – спрос
3. **To convert** – превращать, трансформировать

4. **Thorough** – тщательный, основательный
5. **Contamination** – загрязнение
6. **Inner surface finish** – отделка внутренней поверхности
7. **To reduce** – сокращать, уменьшать
8. **Stainless steel** – нержавеющая сталь
9. **Resistant** – прочный, стойкий
10. **Packless** – без уплотнения (о соединениях), без насадки
11. **Shut-off valve** – запорный клапан, стоп-кран, задвижка
12. **To eliminate** – устранять, исключать
13. **Stringent** – обязательный, точный
14. **Requirement** – требование, необходимое условие
15. **Welding** – сварка
16. **ICP** – (Intrinsic Conductive Polymer) полимер с собственной проводимостью
17. **Mass spectrometry** – оборудование массовой спектрометрии, масс-спектрометрия
18. **Manifold** – газопровод
19. **Capillary columns** – капиллярная колонка, капиллярный столб
20. **System integrity** – целостность системы, герметичность системы
21. **To passivate** – пассивировать

3. Read the text 6B, translate it and compare your ideas in ex.1 with the facts.

Gas Distribution Systems

Natural gas is a vital component of the world's supply of energy and an important source of many bulk chemicals and speciality chemicals. It is one of the cleanest, safest, and most useful of all energy sources, and helps to meet the world’s rising demand for cleaner energy into the future. However, exploring, producing and bringing gas to the user or converting gas into desired chemicals is a systematical engineering project, and every step requires thorough understanding of gas and the surrounding environment.

The choice of materials for gas supply systems is determined by the gas to be distributed and the level of contamination that can be accepted in the gas. The inner surface finish of components is therefore of great importance to the final purity of the gas at the point of use. A

better surface finish will also make the pipe system easier to clean and reduces the risk of particles being released into the gas stream.

In recent years stainless steel has become the number one choice of material for pure gas applications, because it is resistant to corrosion, as well as being consistent with the high standards of cleanliness and appearance in modern laboratories.

The level of gas purity required at each point of use is extremely important in designing a gas delivery system. Selection of materials for construction should be consistent throughout. For example, if a research grade gas is being utilized, all stainless steel construction and diaphragm packless shut-off valves should be used to eliminate contamination of the gas stream.

In general, three levels of purity are sufficient to describe nearly any application.

The first level, usually described as a MULTI-PURPOSE application, has the least stringent purity requirement. Typical applications may include welding, cutting, laser assist, atomic absorption or ICP mass spectrometry. Manifolds for multipurpose applications are economically designed for safety and convenience. Acceptable materials for construction include brass, copper, Teflon®, Tefzel® and Viton®. Packed valves, such as needle valves and ball valves, are often used for flow shut-off. Gas distribution systems manufactured to this level should not be used with high purity or ultra-high purity gases.

The second level, called HIGH-PURITY application, requires a higher level of protection against contamination. Applications include laser resonator gases or chromatography where capillary columns are used and system integrity is important. Materials of construction are similar to multi-purpose manifolds, except flow shut-off valves are diaphragm packless to prevent diffusion of contaminants into the gas stream.

The third level is referred to as ULTRA-HIGH PURITY application. This level requires the highest level of purity for components in a gas delivery system. Trace measurement in gas chromatography is an example of an ultra-high purity application. Wetted materials for manifolds at this level must be selected to minimize trace components adsorption. These materials include 316 Stainless Steel, Teflon®, Tefzel® and Viton®. All tubing should be 316SS cleaned and passivated. Flow shut-off valves must be diaphragm packless.

It is particularly important to recognize that components that are suitable for multi-purpose applications may adversely affect results in high or ultra-high purity applications. For example, out-gassing from neoprene diaphragms in regulators can cause excessive baseline drift and unresolved peaks.

(Source: Gas Distribution Systems)

4. Say if the sentences concerning Text 6A are true or false.

1. Natural gas is a vital component of the world's supply of energy.
2. Natural gas is one of the most dangerous of all energy sources.
3. The choice of materials for gas supply systems is not important.
4. In recent years iron has become the number one choice of material for pure gas applications.
5. In general, three levels of purity are sufficient to describe nearly any application.
6. The third level usually described as a multi-purpose application.
7. Flow shut-off valves must be diaphragm packed.

5. Answer the following questions.

1. Describe natural gas as energy source.
2. How is the choice of materials for gas supply systems determined?
3. Why is the inner surface finish important in a pipe system?
4. What material is applied for pure gas?
5. How many levels of purity do you know? What are they?

6. Fill in the blanks with the correct words denoting types of structures.

Skyscraper, residence, hospital, airport, structure, parking structure

1. A single-family house is an example of a(n) _____ .
2. The city put up a small _____ at the bus stop to protect people from the rain.
3. The tallest building in a big city is usually a(n) _____ .
4. When people are sick, they go to a(n) _____ .
5. The workers keep their cars in a(n) _____ during the day.
6. People travel in and out of the _____ on planes.

7. Speaking. Discuss the following questions and make up a short report.

- Why is it important to protect gas pipe line from corrosion?
- Do you know any anti-corrosion methods of protection?

8. Place the words from the word bank under the correct headings.

vestibule office conference room
entrance stairwell elevator

Moving between levels	Entering a building	Working in a building

Final Tasks

1. Translate the following sentences using the vocabulary of Unit 6.

1. Газоснабжение – это организованная подача и распределение газового топлива для нужд народного хозяйства. 2. Газ широко применяется в коммунальном хозяйстве для приготовления пищи, для технологических нужд предприятий, для нагревания воды, а также для отопления, вентиляции и кондиционирования воздуха жилых и общественных зданий. 3. При газоснабжении используются природные горючие газы, искусственные газы, сжиженные газы. 4. Крупнейшими потребителями природного газа являются предприятия машиностроения, черной и цветной металлургии, теплоэлектростанции. 5. Газоснабжение городов и промышленных предприятий природными и искусственными газами осуществляется по магистральным

газопроводам, транспортирующим газ от мест его добычи или производства к потребителям. 6. Для газоснабжения малоэтажных жилых зданий и небольших коммунальных предприятий обычно применяют автономное газоснабжение. 7. Из-за недостаточного (low) снабжения газа, люди зимой могут остаться без тепла. 8. Добыча газа снизилась на 20% по сравнению с прошлым годом.

2. Speaking. Make up a dialogue on the following topic.

One of you is a customer. The other is a sales consultant specializing in what you are looking for. You're choosing a gas stove to your flat. Give a consultation on the item. Discuss cost, maintenance, exploitation characteristics, advantages and disadvantages of various stoves.

3. Find all the words and give their translation.

c	**c**	**h**	**w**	**e**	**l**	**d**	**i**	**n**	**g**
o	**o**	**e**	**c**	**o**	**p**	**p**	**e**	**r**	**a**
r	**a**	**a**	**b**	**s**	**u**	**p**	**p**	**l**	**y**
r	**l**	**t**	**c**	**c**	**o**	**o**	**k**	**e**	**r**
o	**h**	**e**	**n**	**g**	**i**	**n**	**e**	**e**	**r**
d	**f**	**d**	**e**	**o**	**i**	**l**	**f**	**p**	**g**
e	**u**	**i**	**j**	**k**	**l**	**m**	**n**	**i**	**d**
o	**e**	**p**	**f**	**l**	**a**	**m**	**e**	**p**	**u**
q	**l**	**s**	**y**	**s**	**t**	**e**	**m**	**e**	**c**
r	**s**	**e**	**n**	**e**	**r**	**g**	**y**	**t**	**t**

1._____ 6._____ 11._____

2._____ 7._____ 12._____

3._____ 8._____ 13._____

4._____ 9._____ 14._____

5._____ 10._____ 15._____

4. Project.

- Speak of the history of the development of gas supply system and early gasworks.

- How do recent gasification technologies differ from old gasification technologies?

5. Think of the situations where you can use the following idioms.

Add fuel to the fire, a ball of fire, baptism of fire, between two fires, be under fire, as black as coal, a burning question, burn one's boats, burn one's fingers, burn the candle at both ends, burn the midnight oil, burn up the road, catch fire, draw fire from smb., the fat is in the fire, fight fire with fire, fire in one's belly, fire one's last shot, fire the first shot, flash fire, get on like a house on fire, go down in flames, go through fire and water, hang fire, haul smb. over the coals, have many irons in the fire.

6. Read the sentence pairs. Choose which word or phrase best fits each blank.

1. **position / prevailing wind**

A The architect had to adjust the building's _____.

B A row of thick bushes can protect against the _____.

2. **heat gain / shadow**

A The tree casts a _____ over the parking lot.

B Thick insulation can improve a building's _____.

3. **adjacent / existing**

A The building that is _____ to this one is blocking the sunlight.

B An _____ structure is one that is already there.

Unit 7. HEATING

Text 7A

1. Before you start.

- How can you define a heating system?
- What types of heating systems do you know?

2. Read the words and learn them by heart. Make up your own sentences with them.

1. **Climate-control** – климат-контроль, регулирование состояния воздуха в помещении
2. **Source** – источник
3. **Means** – средство
4. **To distribute** – распределять
5. **Heating system** – отопительная система
6. **Furnace** – печь, котёл
7. **To power** – приводить в действие или движение, обеспечить электроэнергией
8. **Radiator** – батарея отопления, обогреватель
9. **Radiant** – источник тепла
10. **Skirting board** – плинтус, панель
11. **Hydronic heating** – жидкостное отопление
12. **Concrete** – бетон

13. **Driveway** – подъездная дорога; подъездной путь
14. **To accumulate** – накапливать, аккумулировать
15. **Portable** – портативный, переносной
16. **Freestanding** – отдельно стоящий, самостоятельный, автономный

3. Read the text 7A, translate it and label the pictures with the expressions in bold.

Types of Heating Systems

All climate-control devices or systems have three basic components: a source of warmed or cooled air, a means of distributing the air to the rooms being heated or cooled, and a control used to regulate the system (e.g. thermostat). A variety of technologies are available for heating your house:

- In a **central heating system** a furnace or boiler consumes the fuel (e.g. gas, oil, or electricity) that powers it. As fuel is burned, pipes take hot water to radiators. You get hot water at the same time as heating, depending on how you set the controls.
- **Electric heat pumps** remove heat from outdoor air, ground, surface water or the earth and move heat from one place to another. They can also be used as air conditioners when the weather is warm. The thermostat will also include controls for air conditioning.
- **Radiant skirting board heaters** are long, metal units with electrical elements inside. They are sometimes the only source of heat in a house, or they can be an extra heating device in cooler rooms.
- **Radiant ceiling or floor systems** are installed in floors, ceilings or (occasionally) walls. They warm objects in much the same way as the sun does.
- In **hydronic heating** a boiler warms the circulating water and hot water flows through tubes under the floor or through units that are similar to skirting board heaters. They can also be installed in ceilings. They are sometimes used under concrete in driveways to keep snow and ice from accumulating.
- **Portable space heaters** are either freestanding or attached to a wall and work with electricity, gas or kerosene. Their area cannot be qualified as heated living space.

(Source: Flash on English for Construction)

a. _____ **b. _____** **c. _____**

d. _____ **e. _____** **f. _____**

4. Answer the following questions.

1. How many and what components do all climate-control devices or systems have?
2. What variety of technologies available for heating your house can you point out?
3. Describe central heating system.
4. What device can also be used as air conditioner when the weather is warm?
5. How do radiant skirting board heaters look like?
6. Where can hydronic heating be used?
7. What are portable space heaters?
8. What heating system would you personally prefer to install in your house or flat and why?

5. Read the text again and complete the table. More than one answer is possible.

Your demands	What can you use
1. I want a freestanding heater.	*a portable space heater*
2. I have a cool room downstairs.	
3. I want to install heating in the ceiling.	

4. I need to move heat from one place to another.	
5. I want to install a radiant element in the floor.	
6. I need an extra heating device.	
7. I want to use my heater as an air conditioner too.	

6. Match the words denoting measures with their definitions.

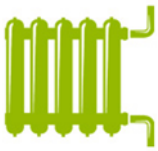
Pound, inch, conversion, centimeter, kilogram, millimeter

1. A unit for measuring weight; 1000 grams.
2. The act or process of changing sth. from one form, use or system to another.
3. A unit for measuring length; a 1000th of a metre.
4. A unit for measuring weight, equal to 0.454 of a kilogram.
5. A unit for measuring length, equal to 2.54 centimeters.
6. A unit for measuring length; a 100th of a metre.

6. Speaking.

What kind of heating system is used in your home? Work in small groups and discuss the advantages and disadvantages of each system. Discuss the costs of installation, maintenance, efficiency.

Text 7B



1. Before you start.

- What does the choice of heating systems depend on?
- How can you use heating more efficiently at home?

2. Read the words and learn them by heart. Make up your own sentences with them.

1. **Consideration** – внимание, рассмотрение
2. **Energy efficiency** – энергоэффективность, энергоотдача
3. **Household** – домашнее хозяйство
4. **Heating load** – тепловая нагрузка

5. **Insulation** – теплоизоляция, утеплитель
6. **Air tightness** – воздухонепроницаемость, гермитичность
7. **Thermostat setting** – установка терморегулятора, регулировка термостата
8. **To determine** – определять, устанавливать
9. **BTU** – British Thermal Unit; британская тепловая единица 0, 252 ккал
10. **Heating contractor** – подрядчик по оборудованию для системы отопления
11. **To measure** – измерять, мерить, определять
12. **Blower** – вентиляторный (о помещении), нагнетательный (насос)
13. **Impact** – влияние, воздействие
14. **To ensure** – обеспечивать, гарантировать
15. **To run on** – использовать топливо
16. **Convective heat** – конвективная теплота
17. **Stairwell** – лестничный проем, лестничная клетка
18. **To figure out** – вычислить, оценивать
19. **Enclosed** – закрытый, замкнутый
20. **Flexibility** – гибкость, подвижность, приспособляемость

3. Read the text 7B, translate it and compare your ideas in ex.1 with the facts.

Heating Systems

Source: www.thehousedesigners.com

Depending on your geography, special consideration should be given to heating your new home. Important items to consider are energy costs, air quality and safety. Since it's a costly installation to any new home it makes good economic sense to look carefully at energy efficiency. Heating alone can account for more than 40% of your household energy costs, for larger homes and families, it's as high as 65%.

The first thing you should do is find out how much heat will be required to adequately and efficiently heat your new home. The heating requirements or "heating load" (as industry professionals say) of a house depends on climate, size, and style of house; insulation levels; air tightness; amount of useful solar energy

through windows; amount of heat given off by lights and appliances; thermostat setting; and other operational factors. Together, these factors determine how much heat must be put into your home by the heating system over the annual heating season. To make it simple, this number (usually measured as BTU per year), should be determined by a competent heating contractor because it involves measuring the house (windows included), checking insulation levels, maybe even doing a blower door test, and running calculations to determine how much heat will be needed in the specific climate you live in. Once this is determined, it is up to you to decide the preferred heating system for your home and what you want it to run on. Oil, gas, wood and propane are a few options.

Types of Heat. Basically there are two ways in which you can have your home heated: radiant or convective heat. Radiant heaters heat the object rather than the air surrounding it, while convection heaters fill a room with warm air by transferring heat from one object to another using moving air or water. The design of your interior home will have a great impact on which form of heat is best for your home. For homes with large open spaces, open stairwells and high ceilings, radiant heaters work best, because they ensure that you and your family are warmed, not the open space surrounding you. If your home has lots of enclosed and well insulated rooms than convective heat, is the heat for you, because it's very easy to control once you've had your home properly zoned.

Central Heating vs. Space Heating. Before you decide whether you want central heating or space heating, you need to figure out which areas of your home you want to heat, how large the rooms are and how long you need to heat the rooms for. By creating zones in your home, you give yourself the flexibility to heat each zone individually, which is the key to energy efficiency. Whether you choose to use space heaters or a zone central heating system, both systems are preferred over using a whole house central heating system, because that system will heat every room in your home regardless of whether you using them or not.

(Source: http://www.thehousedesigners.com/articles/heatingsystems.asp)

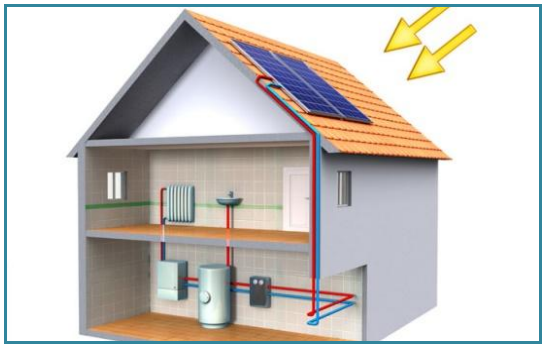
4. Answer the following questions.

1. What items should be taken in consideration when choosing a heating system?
2. How much energy costs can heating alone consume?
3. What do the heating requirements or "heating load" depend on?

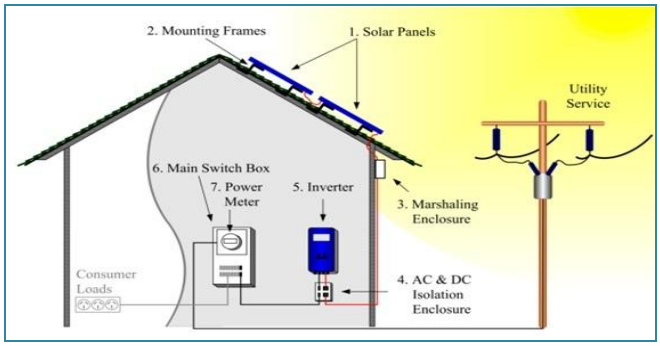
4. What does the work of a heating contractor involve?
5. What are the two basic types of heat?
6. How do radiant heaters work?
7. How do convection heaters work?
8. What does the choice of types of heaters depend on?
9. What is the peculiarity of a whole house central heating system?

5. Complete the text with the words from the box.

Tank, roof, common, pollution, sunlight, storing



Source: deepbluenrg.ca



Source: fromsuntopower.wordpress.com

Solar energy is the electricity produced from the sun's rays and captured by means of solar panels, which are becoming increasingly (1) _____ nowadays. The two types of solar panel systems are solar photovoltaic systems and solar thermal system. In **the solar photovoltaic systems** the solar thermal panels contain cells whose semiconductors react with (2) _____. Electricity is produced when sunlight hits them. This kind of technology is still quite expensive and its disadvantage nowadays is the problem of (3) _____ energy. In **the solar thermal system** solar energy is used for water heating. The panels are positioned either on the (4) _____ or a wall facing the sun and contain flowing water. When the thermal collectors in the panel are exposed to the sun, they heat the water (stored in a hot water cylinder) that is either pumped or driven by natural convection through it. The storage (5) _____ is mounted

immediately above or below the solar collectors on the roof. This system is not very expensive and offers a number of advantages, including being renewable, creating less environmental (6) _____, reducing costs and maintenance and saving resources. Hot water can be produced for most of the year.

A conventional boiler can be used to make the water hotter, or to provide hot water when solar energy is not available.

6. Read the text from ex.5 again and then match the two parts of the sentences.

1	Solar energy	**a**	we can produce energy using solar panels.
2	Thanks to solar thermal systems and solar photovoltaic systems	**b**	are contained whose semiconductors are able to react solar photovoltaic systems with sunlight.
3	The solar thermal panels are usually installed	**c**	when solar energy is not available or to make water installed hotter.
4	In thermal panels special cells	**d**	next to the solar collectors on the roof, either above or below.
5	The storage tank is mounted	**e**	hot water for most of the year.
6	Thanks to these panels you can produce	**f**	means producing electricity from the sun's rays.
7	Sometimes a conventional boiler is used	**j**	exposing the thermal collectors in the panel to the sun.
8	Water is heated by	**h**	on house roofs.

7. Speaking. Discuss the following questions about solar energy.

1. How can electricity be produced using the sun's energy?
2. What do solar thermal panels contain?
3. How is electricity created?
4. What are the two main disadvantages of this energy?
5. What is solar energy also used for?

6. What happens when the thermal collectors are exposed to the sun?
7. Can you name some of the advantages of this system?
8. What can a conventional boiler be used for?
9. Passive solar building design is one of the latest trends in energy conservation. Have you heard anything about it?

Final Tasks

1. Fill in the gaps.

Driveway, radiator, insulation, concrete, portable, stairwell

1. The act of protecting sth. with a material that prevents heat, sound, electricity, etc. from passing through is called _____ .

2. Building material that is made by mixing together cement, sand, small stones and water is called _____.

3. The space in a building in which the stairs are built is called _____.

4. A hollow metal device for heating rooms is called _____.

5. A wide hard path or a private road that leads from the street to a house is called _____.

6. That is easy to carry or to move is called _____.

2. Translate the following sentences from Russian into English.

1. Система обеспечения теплом зданий и сооружений называется теплоснабжением. 2. Теплоснабжение предназначено для обеспечения теплового комфорта людей, находящихся в здании. 3. Система теплоснабжения состоит из следующих функциональных частей: источника производства тепловой энергии (котельная, ТЭЦ); транспортирующих устройств тепловой энергии к помещениям (тепловые сети); теплопотребляющих приборов, которые передают тепловую энергию потребителю (радиаторы отопления, калориферы). 4. По месту выработки теплоты

системы теплоснабжения делятся на централизованные и местные. 5. При централизованной системе теплоснабжения источник производства тепловой энергии работает на теплоснабжение группы зданий и связан транспортными устройствами с приборами потребления тепла. 6. При местной системе теплоснабжения потребитель и источник теплоснабжения находятся в одном помещении или в непосредственной близости. 7. Теплоносители в системе могут быть водяными или паровыми.

3. Match the words denoting measuring units with their definitions.

a. survey	**c**. an altimeter	**e**. theodolite	**g**. level
b. a compass	**d**. peg	**f**. surveyor	**h**. measuring tape

1. An instrument for finding direction, with a needle that always points to the north.
2. An instrument used by surveyors for measuring angles.
3. A glass tube partly filled with liquid, with a bubble of air inside. It is used to test whether a surface is horizontal.
4. A person whose job is to examine and record the details of a piece of land.
5. An instrument for showing height above sea level.
6. A long narrow strip of plastic, cloth or flexible metal that has measurements marked on it and is used for measuring the length of something.
7. A short piece of wood, metal or plastic used for holding things together, hanging things on, marking a position, etc.
8. The act of examining and recording the measurements, features, etc. of an area of land in order to make a map or plan of it.

1.	2.	3.	4.	5.	6.	7.	8.

4. Project.

Unit 8. VENTILATION AND AIR-CONDITIONING

- Speak about the history and development of heating systems in different countries.
- Say what types of heating you consider to be the best.

5. Compile as many words as you can.

CONSTRUCTION

Text 8A

1. Before you start.

- What is ventilation?
- What types of ventilation do you know?
- What is the purpose of ventilation?

2. Read the words and learn them by heart. Make up your own sentences with them.

1. **Ventilation** – вентиляция, движение воздуха
2. **To reduce** – уменьшать, сокращать
3. **Moisture** – влажность, сырость
4. **Odour** – запах (неприятный)
5. **Pollutant** – загрязнитель, загрязняющая примесь
6. **Radon** – радон
7. **Contaminant** – загрязнитель, загрязняющее вещество
8. **Volatile** – переменчивый, нестабильный
9. **To accumulate** – накапливаться

10. **Damage** – вред, повреждение
11. **Vent** – вентиляционное отверстие
12. **Extractor fan** – вытяжной вентилятор
13. **To exhaust** – вытягивать, высасывать
14. **Stale air** – спёртый, тяжелый воздух
15. **Supply ventilation** – приточная вентиляция, нагнетающая вентиляция
16. **Balanced ventilation** – уравновешенная вентиляция, приточно-вытяжная вентиляция

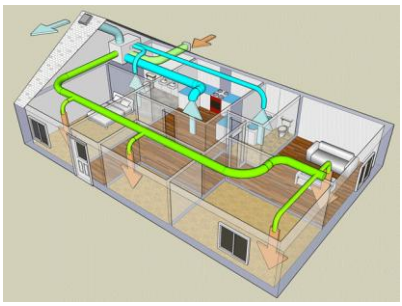
3. Read the text 8A, translate it and compare your ideas in ex.1 with the facts. Label the pictures with the words in bold from the text.

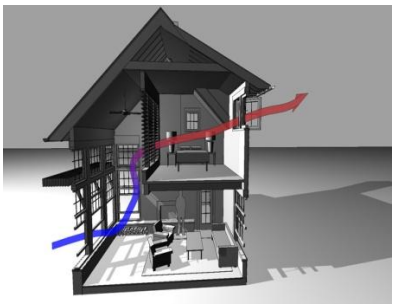
Ventilation

Ventilation – the exchange of indoor air with outdoor air – is important to reduce indoor moisture, odours, and other pollutants. Contaminants such as volatile organic compounds, and radon (that may cause health problems) can accumulate in poorly ventilated homes. Excess moisture needs to be removed before high humidity levels lead to physical damage to the home. There are three main types of ventilation:

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

(Source: Flash on English for Construction)





a. _____ **b. _____** **c. _____**

4. Answer the following questions.

1. Define ventilation.
2. Why is ventilation important?
3. What contaminants do you know?
4. What happens if too much moisture is not removed from the inside of your home?
5. How many types of ventilation do you know?
6. What is the disadvantage of natural ventilation?
7. What is spot ventilation?
8. How does whole-house ventilation work?
9. How are whole-house ventilation systems usually classified?

5. Using vocabulary in ex.2 match the words with their definitions.

Word	Definition
1. to ventilate	**a.** the mixture of gases that surrounds the earth and that we breathe.
2. moisture	**b.** any plant without leaves, flowers or green colouring, usually growing on other plants or on decaying matter.
3. odour	**c.** more than is necessary, reasonable or acceptable.
4. pollutant	**d.** waste gases that come out of a vehicle, an engine or a machine.
5. to reduce	**e.** a substance that pollutes sth., especially air and water.

6. exhaust	**f.** to make a substance or place dirty or no longer pure by adding a substance that is dangerous or carries disease.
7. excess	**g.** to allow fresh air to enter and move around a room, building, etc.
8. fungi	**h.** to make sth. less or smaller in size, quantity, price, etc.
9. air	**i.** a smell, especially one that is unpleasant.
10. to contaminate	**j.** very small drops of water that are present in the air, on a surface or in a substance.

6. Discuss the key properties and different types and grades of the following materials. Give examples of the properties that make each material good or bad for pipes and other house systems production, from a quality perspective.

Materials							
steel	glass	aluminium	titanium	gold	plastic	copper	rubber

Properties					
water-resistant	abrasion-resistant	corrosion-resistant	shock-resistant	tough	
brittle	elastic	durable	heavy	lightweight	stable

7. In small groups, choose a well-known consumer product or appliance used in construction industry and discuss it from a quality perspective. How suitable are the materials used? How good is the product, compared with others sold by competitors?

8. Match the following words with their synonyms.

framework | to mix | rubbish | place

to corrode | site | garbage | to stir

structure | to rust

Text 8B

1. Before you start.

- What is air-conditioning?
- What are its purposes?

2. Read the words and learn them by heart. Make up your own sentences with them.

1. **To alter** – изменять, переделывать
2. **Evaporation** – испарение
3. **Desiccant** – осушитель, влагопоглотитель
4. **To modify** – видоизменять, снижать, модифицировать
5. **Reed** – тростник, камыш
6. **Trickling water** – просачивающаяся вода
7. **Beneficial** – полезный, целительный, благотворный
8. **To involve** – включать, содержать, подразумевать
9. **To emerge** – появляться, показываться
10. **To enable** – позволять, давать возможность
11. **Velocity** – скорость
12. **To provide** – способствовать, обеспечивать

3. Read the text 8B, translate it and compare your ideas in ex.1 with the facts.

Air Conditioning

Air conditioning is the process of altering the properties of air (primarily temperature and humidity) to more comfortable conditions, typically with the aim of distributing the conditioned air to an occupied space to improve thermal comfort and indoor air quality.

Air conditioning units outside a building

In common use, an air conditioner is a device that lowers the air temperature. The cooling is typically achieved through a refrigeration cycle, but sometimes evaporation or free cooling is used. Air conditioning systems can also be made based on desiccants.

In the most general sense, air conditioning can refer to any form of technology that modifies the condition of air (heating, cooling, humidification, cleaning, ventilation, or air movement). However, in construction, such a complete system of heating, ventilation, and air conditioning is referred to as HVAC.

The basic concept behind air conditioning is said to have been applied in ancient Egypt, where reeds were hung in windows and were moistened with trickling water. The evaporation of water cooled the air blowing through the window. This process also made the air more humid, which can be beneficial in a dry desert climate. In Ancient Rome, water from aqueducts was circulated through the walls of certain houses to cool them. Other techniques in medieval Persia involved the use of cisterns and wind towers to cool buildings during the hot season.http://en.wikipedia.org/wiki/Air_conditioning - cite_note-3

Window unit inside a room

Modern air conditioning emerged from advances in chemistry during the 19th century, and the first large-scale electrical air conditioning was invented and used in 1902 by American inventor Willis Carrier. The introduction of residential air conditioning in the 1920s helped enable the great migration to the Sun Belt in the United States.

Air-conditioning is the bringing of air in a building to a desired temperature, purity, and humidity throughout the year to maintain healthy

and comfortable atmosphere. Air-conditioning may be divided into two main sections: one for the processing of materials in industry, the other for human comfort.

Air-conditioning provides the following services:

1. Filtration of the air both in winter and summer to remove dust.
2. Circulation of the air at low velocity and with proper diffusion to prevent draughts and maintain a uniform temperature and humidity at all parts of the inhabited space.
3. Introduction of enough fresh air from the outside atmosphere.
4. Heating of the air in winter.
5. Cooling of the air in summer below the outside atmosphere.
6. Humidify the air in winter to a relative humidity of at least 20-25 per cent.
7. Dehumidify the air in summer to a relative humidity not exceeding 55 per cent.

(Source: http://en.wikipedia.org/wiki/Air_conditioning)

4. Answer the following questions.

1. Define the process of air-conditioning.
2. What is the aim of the air-conditioning process?
3. What is an air-conditioner?
4. How did air-conditioning evolve?
5. When did modern air-conditioning emerge?
6. What are the two main sections that air-conditioning may be divided into?
7. What services does air-conditioning provide?

5. Give English equivalents of the following words and word combinations from Text 8B.

Изменяя качество воздуха, более комфортные условия, распределяя очищенный воздух, занимаемая площадь, улучшать тепловые комфортные условия, качество воздуха в помещении, понижает температуру воздуха, цикл охлаждения, естественное охлаждение, использование цистерн и анемометрических вышек, прогресс в химии, большой электрический кондиционер, поддерживать здоровую и комфортную атмосферу, производство материалов.

6. Say whether the following statements are true or false. For the search of correct answers refer to Internet resources.

1. Modern air-conditioners give comfort in hot weather, but they cost a lot of money.
2. After ten years of exploitation an air-conditioner should be replaced by a new one.
3. EnerGuide label shows how much energy a particular item of equipment consumes in five years of normal service.
4. Air-conditioners use a kWh rating.
5. An air-conditioner must have a SEER of at least 10 to be sold in the United States.
6. Typical air-conditioning units use outdoor evaporator coil and indoor condenser.
7. Central air-conditioners not only cool air, but also dehumidify.

7. Speaking. One of you is a customer. The other is a sales consultant specializing in what you are looking for. You're choosing an air-conditioner to your flat. Give a consultation on the item. Make up a dialogue.

8. Complete the following table.

Verb	Noun	Adjective
corrode		
	container	
		insulating
	ventilation	
enumerate		
		explanatory
	building	
achieve		
	contractor	
		evaporating

9. Discuss the following questions with your groupmates.

1. Express your personal attitude to the installation of air-conditioner at home. Is it necessary?
2. Enumerate pros and cons of air-conditioners.
3. What is central air-conditioning (individual air-conditioning; split-system)?
4. What other types of air-conditioners do you know? Study the question yourself and prepare a short report.
5. Why is it important to install ventilation system correctly?
6. On what stage of building construction should ventilation system be taken into regard?
7. What are the rules of proper maintenance (exploitation) of air-conditioner?

Final Tasks

1. Fill in the gaps using the words below:

Emerged, excess, humid, evaporating, ventilated, polluted, odour, exhaust, moisturizing, reduces

1. The bathroom is _____ by means of an extractor fan. 2. Use your _____ cream every day to make your skin less dry. 3. When we entered a bar, we could smell the stale _____ of cigarette smoke. 4. The river has been _____ with toxic waste from local factories. 5. Giving up smoking _____ the risk of heart disease. 6. My car needs a new _____. 7. Driving with _____ alcohol in the blood is a serious offence. 8. The sun is constantly _____ the earth's moisture. 9. New method of pipes installation has _____ recently. 10. The island is hot and _____

2. Retell the following text in English.

Кондиционер – устройство для поддержания оптимальных климатических условий в квартирах, домах, офисах, автомобилях, а также для очистки воздуха в

помещении от загрязнений. Он предназначен для снижения температуры воздуха в помещении при жаре, или повышении температуры воздуха в холодное время года в помещении. В 1815 году француз Жанн Шабаннес получил британский патент на метод кондиционирования воздуха и регулирования температуры в жилищах и других зданиях. В 1902 году американский инженер-изобретатель Уиллис Кэрриер (Willis Carrier) собрал промышленную холодильную машину для типографии Бруклина в Нью-Йорке. Первый кондиционер предназначался не для создания приятной прохлады работникам, а для борьбы с влажностью, сильно ухудшавшей качество печати. Первый комнатный кондиционер был выпущен компанией General Electric в 1929 году. В качестве хладагента в этом устройстве использовался аммиак, который был небезопасен для здоровья человека. Начиная с 1931 года стал использоваться фреон. Долгое время лидерство в области новейших разработок по вентиляции и кондиционированию воздуха принадлежало американским компаниям, однако в конце 50-х – начале 60-х годов XX века инициатива перешла к японцам.

3. Make up questions to the following sentences.

1. He installed an expensive air-conditioner at his office. (*Who? What? Where?*)
2. It is very hot in here, you should switch on the air-conditioner. (*Why? What? Who?*)
3. An air-conditioner helps to keep the comfortable level of humidity in the room. (*What? What level? Where?*)
4. He bought an expensive air-conditioner last month. (*Who? What? When?*)
5. Air-conditioners are used in flats, offices, cars to keep optimal climatic conditions. (*What? Where? What for?*)
6. The first air-conditioner was produced in 1929 by General Electrics company. (*What? When? By whom?*)

4. Think of the situations where you can use the following idioms.

After the dust settles, be in the wind, bite the dust, blow hot and cold, blow off steam, blow one's own horn, blow one's own trumpet, blow one's top, blow sth. open, blow smb. a kiss, blow sth. into atoms, blow sth. sky-high, blow the gaff, blow the lid off smb., clear the air, dust and ashes, eat the dust, gather dust, get the wind up, give oneself airs.

5. Write a word or phrase that is similar in meaning to the underlined part.

1. The <u>layout for the interior of the building</u> shows a spiral staircase.

   _l_ _r p_a_

2. The architect wrote an <u>educated guest of how much money was needed for the project</u>.

   c_ _t _st_ _a_e

3. The client decided to put extra <u>material to prevent loss of heat</u> in the attic.

   _ _s_l_t_ _n

4. Leslie painted the <u>piece of furniture for the storage and display of items</u> white.

   _ab_n_ _

5. My office bought a new <u>system for the circulation of warm and cool air</u>.

   _ _A_ sy_ _ _m

6. Find all the words and give their translation.

f	**c**	**o**	**n**	**d**	**e**	**n**	**s**	**e**	**r**
u	**f**	**a**	**v**	**a**	**p**	**o**	**u**	**r**	**b**
n	**a**	**h**	**u**	**m**	**i**	**d**	**i**	**t**	**y**
g	**n**	**p**	**o**	**l**	**l**	**u**	**t**	**e**	**c**
i	**d**	**l**	**c**	**o**	**n**	**d**	**u**	**c**	**t**
e	**o**	**i**	**f**	**i**	**l**	**t**	**e**	**r**	**f**
c	**d**	**q**	**c**	**o**	**l**	**l**	**e**	**c**	**t**
o	**o**	**u**	**g**	**h**	**a**	**i**	**r**	**i**	**j**
i	**u**	**i**	**k**	**d**	**e**	**v**	**i**	**c**	**e**
l	**r**	**d**	**c**	**a**	**r**	**b**	**o**	**n**	**l**

	6._____	11._____
1._____		
2._____	7._____	12._____
3._____	8._____	13._____
4._____	9._____	14._____
5._____	10._____	15._____

7. Read the text. Then work in small groups. Make a list of the energy-saving methods that you and your family use at home. Compare your habits with those of the others.

There are a lot of very simple ways to save energy. Employ just a few of the following suggestions and you can cut your annual energy bills considerably.

• When you substitute your old domestic devices, choose the most energy-efficient models (AAA labelled ones are very energy efficient).

• Turn off domestic electrical appliances (instead of using the stand-by mode).

• Use fluorescent light bulbs: they may be more expensive, but they use only ¼ the energy of an ordinary incandescent bulb and last 8-12 times longer.

• Make sure your dishwasher is full before using it.

• Turn down your water heater thermostat.

(Source: Flash on English for Construction)

Unit 9. ENVIRONMENT AND POLLUTION

Text 9A

1. Before you start.

- Read the questionnaire and tick (v) the best answers for you.
- Then read the text below and check your answers.

	Yes	No	Don't know
1. Ecology is a science.			
2. It deals with living organisms.			
3. It also deals with the environment of living organisms.			
4. Climate, solar insulation and geology influence the environment.			
5. Ecology is also called 'ecological science'.			
6. Ecology makes use of other sciences.			

2. Read the words and learn them by heart. Make up your own sentences with them.

1. **Living organisms** – живые организмы
2. **Environment** – окружающая среда
3. **To distribute** – распределять
4. **To influence** – влиять
5. **In turn** – в свою очередь
6. **Solar insulation** – солнечное излучение
7. **Habitat** – среда обитания, условия существования
8. **To draw on** – обращаться, использовать (сведения), привлекать

3. Read the text 9A, translate it and compare your ideas in ex.1 with the facts.

Source: http://happy93blogspotcom.

Ecology: a General Overview

You can say 'yes' to every question in the questionnaire above. Ecology is the science that studies the number of living organisms in the environment and how they are distributed. It also studies how the quantity and distribution of organisms are influenced and in turn influence their interactions with the environment. The environment of an organism includes factors such as climate, solar insulation, geology and the other organisms that share its habitat. Ecology is also called 'ecological science' and it is multi-disciplinary: this means that it draws on other branches of science, such as biology, geology, geography, meteorology, chemistry and physics.

Ecologists seek to explain:

- Life processes, interactions and adaptations;
- The movement of materials and energy through living communities;
- The successional development of ecosystems;
- The abundance and distribution of organisms and biodiversity in the context of the environment.

(Source: Flash on English for Construction)

4. Read the text again and choose the correct option.

1. Ecology studies …	**2. Ecology is also called…**	**3. Ecology makes use of …**
a. the quantity of organisms in the environment.	**a.** meteorology.	**a.** other sciences.
b. how organisms are distributed.	**b.** ecological science.	**b.** the environment.
c. both of these.	**c.** physics.	**c.** solar insulation.

5. Put these words in the correct column.

minerals, atoms, living organisms, cells, rocks, history of the Earth, chemical bonds, rivers, lands

Biology	Geography	Geology	Chemistry

6. Complete the interview with the expressions from the box.

at different levels, the dynamics of population, the sphere of water, behavioral ecology, about ecology and its sub-disciplines, the sphere of air, you can also examine, communities of species

Ecology and its Sub-disciplines

Interviewer: Mr Hale, could you tell us something (1) _____?

Mr Hale: Well, as you know ecology has a great number of sub-disciplines. Some are more complex than others. For example, physiological and (2) _____ focuses on the adaptations of the individual to his environment; population ecology examines (3) _____ of a single species; community ecology studies the interactions between species in an ecological community. Ecosystem and landscape ecology are even more complex.

Interviewer: Can ecology be studied (4) _____?

Mr Hale: Yes, of course. If you study the population level, you focus on individuals of the same species, but (5) _____, ecosystem or biosphere levels.

Interviewer: Can you explain how the outer layer of the planet Earth can be divided?

Mr Hale: Yes, there are basically three compartments: the hydrosphere is (6) _____, the lithosphere is the sphere of soil and rocks and the atmosphere is (7) _____.

Interviewer: And what about the biosphere?

Mr Hale: Well, that's the sphere of life. In short, it is the part of our planet occupied by life.

7. Read the interview again and decide if the statements below are true (T) or false (F).

1. The sub-disciplines of ecology are all very complex.
2. Population ecology examines the population dynamics of a single species.
3. Ecosystem and landscape ecology are more complex than other forms of ecology.
4. If you study the population level, you concentrate on communities of species.
5. The outer layer of the planet Earth can be divided into four compartments.
6. The hydrosphere is the sphere of water.
7. The biosphere is the sphere of soil and rocks.

8. Speaking. Discuss the following questions.

1. What is ecology? What does it study?
2. How is it a multidisciplinary science?
3. What are the sub-divisions of ecology?
4. What does community ecology study?
5. What do you focus on if you study the population level?
6. How can the outer layer of the planet Earth be divided?
7. What is the lithosphere?
8. What is the atmosphere?
9. What is the biosphere?
10. What is human ecology?

Text 9B

1. Before you start.

- What do we need land for?
- Make a list of all the types of activities that we can apply land for.

2. Read the words and learn them by heart. Make up your own sentences with them.

1. **Well-being** – благосостояние, благополучие
2. **Waste** – отходы
3. **Vital** – жизненно важный, существенный
4. **By-products** – отходы производства
5. **To damage** – повреждать, наносить ущерб
6. **Soil** – грунт, земля, почва
7. **Fibre** – волокно, ткань
8. **To regenerate** – восстанавливать, регенерировать
9. **Species** – биологический вид, особь
10. **Consequently** – следовательно, в результате, поэтому

3. Read the text 9B, translate it and compare your ideas in ex.1 with the facts.

Ecosystems

The quality of the land around us is very important for our well-being. We need land to create energy, to grow fruit and vegetables and to bury waste. We also need it for mineral resources, for building houses, factories, schools and hospitals, for transportation, for free time activities and much more. Land is also a vital habitat for plants and animals. But many human activities, such as industry, agriculture and transportation, and their by-products, as well as intentional or accidental pollution, can damage the soil and harm the quality of land. Soil is extremely important for the environment, because water and vital substances such as vitamins, minerals and fibres are stored and regenerated in it. It is also an essential medium for

growing crops. And it has another fundamental function: it acts as a barrier between the atmosphere and aquatic ecosystems. However, this barrier is lost if soil is damaged or contaminated, with the consequence that the soil becomes a source of pollutants that can enter surface or groundwater and even damage the quality of air and consequently the health of plants, animals and people. Toxic substances can be dangerous for individual species and have long-term effects on ecosystems.

(Source: Flash on English for Construction)

4. Answer the following questions.

1. What do we need land for?
2. Who is land vital habitat for?
3. What human activities can damage the soil and harm the quality of land?
4. Why is soil extremely important for the environment?
5. What is a fundamental function of soil?
6. How can toxic substances influence our environment?

5. Using vocabulary in ex.2 match the words with their definitions.

Word	Definition
1. waste	**a.** something created while producing or processing another product.
2. habitat	**b.** waste found under the ground.
3. groundwater	**c.** substances that pollute the environment.
4. by-product	**d.** material that is no longer been wanted because its valuable part has already been used.
5. medium	**e.** natural environment where animals and plants grow.
6. pollutants	**f.** a substance that acts as a vehicle for a particular purpose.

6. Read the text about the forms of pollution and decide which of these are represented in the pictures.

Pollution is the release of chemical, biological, physical or radioactive substances in the environment. Among the main kinds of pollution are:

• **Air pollution**: due to the release of chemicals and particulates (solid particles forming dust) such as nitrogen oxides that create smog and hydrocarbons. Other examples of air pollution are carbon monoxide and sulphur dioxide.

• **Water pollution**: caused by industrial waste, agricultural drainage and sewage.

• **Soil contamination**: the most significant soil contaminants are heavy metals, hydrocarbons, herbicides and pesticides.

• **Radioactive contamination**: caused by accidents in nuclear power stations and by the production and use of nuclear weapons.

• **Noise pollution**: including roadway, aircraft and industrial noise and high-intensity sonars.

• **Light pollution**: including light trespass and over-illumination.

• **Visual pollution**: referring to the presence of overhead power lines, motorway billboards or open storage of junk and municipal solid waste.

(Source: Flash on English for Construction)

7. Read the text again and fill in the chart.

Type of pollution	Examples
Air pollution	*carbon monoxide*
Water pollution	
Soil contamination	
Radioactive contamination	
Noise pollution	
Light pollution	
Visual pollution	


8. Write down a list of the sources of pollution that exist in the area where you live and write a short essay about the possible solutions to these problems. Discuss your projects in class.

In my area there is a lot of air and water pollution due to the chemicals the farmers use on their fields ...

Final Tasks

1. Read the sentence pairs. Choose which word best fits each blank.

1. landscape / slope

A. The mountains and trees are part of the area's beautiful _____.

B. The house sits at the bottom of a _____.

2. terrain / grade

A. The _____ of the hill is too steep for building.

B. The _____ in the area is rough and rocky.

3. level / open

A. Large areas with no buildings or trees are called _____ land.

B. The site used to have a slope, but now it is completely _____.

4. energy-efficient / earth-bermed

A. The builders installed _____ windows in the new house.

B. The building is _____, so it's partly underground.

2. Translate the following sentences using the vocabulary of Unit 9.

1. Организация по предоставлению гуманитарной помощи (humanitarian aid organization) раздала еду и медикаменты жертвам землетрясения. 2. Курение пагубно влияет на здоровье. 3. Благосостояние в этом регионе значительно выросло за последние несколько лет. 4. Радиоактивные отходы очень опасны для людей и окружающей среды. 5. Вода – жизненно важный продукт. 6. При сгорании пластик выделяет (to produce) опасные отходы. 7. Оставленный мусор в лесах разрушает экосистему. 8. Почва в этом регионе очень плодородна (fertile). 9. В «Красную книгу» (Red Data Book) занесены редкие виды растений и животных. 10. Загрязненная природа очень трудно восстанавливается.

3. Compile as many words as you can with the letters of the word:

ENVIRONMENT

4. Read the text and answer the questions below.

Sustainable Materials

Due to the rise in global population and prosperity over the last few decades, one of the consequences of this phenomenon has been the increase in volume and variety of the materials used (such as raw materials, food, manufactured products and waste) with a consequent increase in the transport distances. This has created a series of negative effects on the environment, especially different kinds of pollution, leading to an ecological emergency and growing

preoccupation about health. This is why the aim of eco-design is to create buildings with low ecological impact, where people can live in a comfortable, healthy way. This is possible by using building materials that are traditionally considered eco-friendly and-sustainable: timber from forests that have been certified; quickly renewable plant materials (such as straw or bamboo); some typical traditional materials such as brick, stone, clay and cork; non-toxic, renewable and recyclable materials (natural paints, waxes and varnishes). Waste materials can also be reused as a resource for construction purposes.

(Source: Flash on English for Construction)

1. What has happened to population and wealth in the last few decades?
2. What has been one of the results of this?
3. What is the aim of eco-design?
4. Can you name some eco-friendly and sustainable materials you have found in the text?

5. Read the text about eco-materials. Name two examples of them. What characteristics should eco-materials have?

The materials used in bio-architecture should be chosen paying attention to the damage (production of toxic gases, water and soil pollution) that they may cause to the environmental ecosystem. Eco-materials should:

• be biodegradable and recyclable;

• not be dangerous for our health;

• contribute to a more sustainable environmental future. Examples of materials that can be used in bio-architecture are timber, brick, stone, cork and natural paints and varnishes. It is easy to choose eco-friendly materials thanks to certifications.

(Source: Flash on English for Construction)

6. Speaking. Work in pairs: what new eco-friendly and eco-efficient technologies and techniques are used in modern construction industry? What is your opinion of modern building materials? Which would you use if you could build your own house?

APPENDIX

1. From the History of the Development of Water Treatment

The following table illustrates historical events and developments that have been precursors to development of modern water supply and treatment systems.

Period	Event
4000 B.C.	Ancient Sanskrit and Greek writings recommend water treatment methods. In the Sanskrit Ousruta Sanghita it is noted that ‘‘impure water should be purified by being boiled over a fire, or being heated in the sun, or by dipping a heated iron into it, or it may be purified by filtration through sand and coarse gravel and then allowed to cool.’’
3000 to 1500 B.C.	Minoan civilization in Crete develops technologies so advanced they can only be compared to modern urban water systems developed in Europe and North America in the second half of the nineteenth century. Technology is exported to Mediterranean region.
1500 B.C.	Egyptians reportedly use the chemical alum to cause suspended particles to settle out of water. Pictures of clarifying devices were depicted on the wall of the tomb of Amenophis II at Thebes and later in the tomb of Ramses II.
Fifth century B.C.	Hippocrates, the father of medicine, notes that rainwater should be boiled and strained. He invents the ‘‘Hippocrates sleeve,’’ a cloth bag to strain rainwater.
Third century B.C.	Public water supply systems are developed at the end of the third century B.C. in Rome, Greece, Carthage, and Egypt.
340 B.C. to 225 A.D.	Roman engineers create a water supply system that delivers water [490 megaliters per day (130 million gallons per day)] to Rome through aqueducts.
1676	Anton van Leeuwenhoek first observes microorganisms under the microscope.
1703	French scientist La Hire presents a plan to French Academy of Science proposing that every household have a sand filter and rainwater cistern.
1746	French scientist Joseph Amy is granted the first patent for a filter design. By 1750 filters composed of sponge, charcoal, and wool could be purchased for home use.

1804	The first municipal water treatment plant is installed in Paisley, Scotland. The filtered water is distributed by a horse and cart.
1807	Glasgow, Scotland, is one of the first cities to pipe treated water to consumers.
1829	Installation of slow sand filters in London, England.
1835	Dr. Robley Dunlingsen, in his book Public Health, recommends adding a small quantity of chlorine to make contaminated water potable.
1846	Ignaz Semmelweiss (in Vienna) recommends that chlorine be used to disinfect the hands of physicians between each visit to a patient. Patient mortality drops from 18 to 1 percent as a result of this action.
1854	John Snow shows that a terrible epidemic of Asiatic cholera can be traced to water at the Broad Street Well, which has been contaminated by the cesspool of a cholera victim recently returned from India. Snow, who does not know about bacteria, suspects an agent that replicates itself in the sick individuals in great numbers and exits through the gastrointestinal tract, and is transported by the water supply to new victims.
1854	Dr. Falipo Pacini, in Italy, identifies the organism that causes Asiatic cholera, but his discovery goes largely unnoticed.
1856	Thomas Hawksley, civil engineer, advocates continuously pressurized water systems as a strategy to prevent external contamination.
1864	Louis Pasteur articulates the germ theory of disease.
1874	Slow sand filters are installed in Poughkeepsie and Hudson, New York.
1880	Karl Eberth isolates the organism (Salmonella typhosa) that causes typhoid fever.
1881	Robert Koch demonstrates in the laboratory that chlorine will inactivate bacteria.
1883	Carl Zeiss markets the first commercial research microscope.
1884	Professor Escherich isolates organisms from the stools of a cholera patient that he initially thought were the cause of cholera. Later it is found that similar organisms are also present in the intestinal tracts of every healthy individual as well. Organism eventually named for him (Escherichia coli).
1884	Robert Koch proves that Asiatic cholera is due to a bacterium, Vibrio cholerea, which he calls the comma bacillus because of its comma-like shape.

1892	A cholera epidemic strikes Hamburg, Germany, while its neighboring city, Altona, which treats its water using slow sand filtration, escapes the epidemic. Since that time, the value of granular media filtration has been widely recognized.
1892	The New York State Board of Health uses the fermentation tube method developed by Theobald Smith for the detection of E. coli to demonstrate the connection between sewage contamination of the Mohawk River and the spread of typhoid fever.
1893	First sand filter built in America for the express purpose of reducing the death rate of the population supplied is constructed at Lawrence, Massachusetts. To this end, the filter proves to be a great success.
1897	G. W. Fuller studies rapid sand filtration [5 cubic meters per square meter per day (2 gallons per square foot per day)] and finds that bacterial removals are much better when filtration is preceded by good coagulation and sedimentation.
1902	The first drinking water supply is chlorinated in Middelkerke, Belgium. Process is actually the ‘‘Ferrochlor’’ process wherein calcium hypochlorite and ferric chloride are mixed, resulting in both coagulation and disinfection.
1903	The iron and lime process of treating water (softening) is applied to the Mississippi River water supplied to St Louis, Missouri.
1906	First use of ozone as a disinfectant in Nice, France. First use of ozone in the United States occurs some four decades later.
1908	George Johnson, a member of Fuller’s consulting firm, helps install continuous chlorination in Jersey City, New Jersey.
1911	Johnson publishes ‘‘Hypochlorite Treatment of Public Water Supplies’’ in which he demonstrates that filtration alone is not enough for contaminated supplies. Adding chlorination to the process of water treatment greatly reduces the risk of bacterial contamination.
1914	U.S. Public Health Service (U.S. PHS) uses Smith’s fermentation test for coliform to set standards for the bacteriological quality of drinking water. The standards applied only to water systems that provided drinking water to interstate carriers such as ships and trains.
1941	Eighty-five percent of the water supplies in the United States are chlorinated,

	based on a survey conducted by U.S. PHS.
1942	U.S. PHS adopts the first comprehensive set of drinking water standards.
1974	Dutch and American studies demonstrate that chlorination of water forms trihalomethanes.
1974	Passage of the Safe Drinking Water Act (SDWA).

(Source: Crittenden J.C. Water Treatment: Principles and Design)

2. Selection of Water Treatment Processes

To produce water that is safe to drink and aesthetically pleasing, treatment processes must be selected that, when grouped together, can be used to remove specific constituents. The most critical determinants in the selection of water treatment processes are the quality of the water source and the intended use of the treated water. The two principal water sources are groundwater and surface water. Depending on the hydrogeology of a basin, the levels of human activity in the vicinity of the source, and other factors, a wide range of water qualities can be encountered. Surface waters typically have higher concentrations of particulate matter than groundwater, and groundwater often has increased concentrations of dissolved minerals due to the long contact times between subsurface water with rocks and minerals. Surface water may have more opportunity for exposure to anthropogenic chemicals.

Another major distinction is based on the level of dissolved salts or total dissolved solids (TDS) present in the water source. Water containing TDS less than 1000 mg/L is considered to be freshwater, and water with TDS between 1000 and 10,000 mg/L is considered to be brackish water.

Freshwater is the most easily used for drinking water purposes, and brackish water can be used under specific circumstances with adequate treatment.

Finally, the most abundant water source, the ocean, contains approximately 35,000 mg/L TDS and requires demineralization prior to use. Each of the predominant types of water sources, including natural or man-made lakes and rivers, requires a different treatment strategy.

The steps that are typically involved in the selection and implementation of water treatment plants are:

1. Characterization of the source water quality and definition of the treated water quality goals or standards.

2. Predesign studies, including pilot plant testing, process selection, and development of design criteria.

3. Detailed design of the selected alternative.

4. Construction.

5. Operation and maintenance of the completed facility.

These five steps may be performed as discrete steps or in combination and require input from a wide range of disciplines, including engineering, chemistry, microbiology, geology, architecture, and financial analysis. Each discipline plays an important role at various stages in the process. The predominant role, however, rests with professional engineers who carry the responsibility for the success of the water treatment process.

(Source: Crittenden J.C. Water Treatment: Principles and Design)

3. Sustainable Urban Water Supply

A sustainable urban water supply network covers all the activities related to provision of potable water. Sustainable development is of increasing importance for the water supply to urban areas.

Water is an essential natural resource for human existence. It is needed in every industrial and natural process, for example, it is used for oil refining, for liquid-liquid extraction in hydro-metallurgical processes, for cooling, for scrubbing in the iron and the steel industry and for several operations in food processing facilities, etc. It is necessary to adopt a new approach to design urban water supply networks; water shortages are expected in the forthcoming decades and environmental regulations for water utilization and waste-water disposal are increasingly stringent.

To achieve a sustainable water supply network, new sources of water are needed to be developed, and to reduce environmental pollution.

The price of water is increasing, so less water must be wasted and actions must be taken to prevent pipeline leakage. Shutting down the supply service to fix leaks is less and less tolerated by consumers. A sustainable water supply network must monitor the freshwater consumption rate and the waste-water generation rate.

Many of the urban water supply networks in developing countries face problems related to population increase, water scarcity, and environmental pollution.

(Source: http://en.wikipedia.org/wiki/Water_supply_network)

4. Disinfection

The purpose of disinfection in the treatment of waste water is to substantially reduce the number of microorganisms in the water to be discharged back into the environment for the later use of drinking, bathing, irrigation, etc. The effectiveness of disinfection depends on the quality of the water being treated (e.g., cloudiness, pH, etc.), the type of disinfection being used, the disinfectant dosage (concentration and time), and other environmental variables. Cloudy water will be treated less successfully, since solid matter can shield organisms, especially from ultraviolet light or if contact times are low. Generally, short contact times, low doses and high flows all militate against effective disinfection. Common methods of disinfection include ozone, chlorine, ultraviolet light, or sodium hypochlorite. Chloramine, which is used for drinking water, is not used in the treatment of waste water because of its persistence. After multiple steps of disinfection, the treated water is ready to be released back into the water cycle by means of the nearest body of water or agriculture. Afterwards, the water can be transferred to reserves for everyday human uses.

Chlorination remains the most common form of waste water disinfection due to its low cost and long-term history of effectiveness. One disadvantage is that chlorination of residual organic material can generate chlorinated-organic compounds that may be carcinogenic or harmful to the environment. Residual chlorine or chloramines may also be capable of chlorinating organic material in the natural aquatic environment. Further, because residual chlorine is toxic to aquatic species, the treated effluent must also be chemically dechlorinated, adding to the complexity and cost of treatment.

Ultraviolet (UV) light can be used instead of chlorine, iodine, or other chemicals. Because no chemicals are used, the treated water has no adverse effect on organisms that later consume it, as may be the case with other methods. UV radiation causes damage to the genetic structure of bacteria, viruses, and other pathogens, making them incapable of reproduction. The key disadvantages of UV disinfection are the need for frequent lamp maintenance and replacement and the need for a highly treated effluent to ensure that the target microorganisms are not shielded from the UV radiation (i.e., any solids present in the treated effluent may protect microorganisms from the UV light). In the United Kingdom, UV light is becoming the most common means of disinfection because of the concerns about the impacts of chlorine in chlorinating residual organics in the wastewater and in chlorinating organics in the

receiving water. Some sewage treatment systems in Canada and the US also use UV light for their effluent water disinfection.

Ozone (O_3) is generated by passing oxygen (O_2) through a high voltage potential resulting in a third oxygen atom becoming attached and forming O_3. Ozone is very unstable and reactive and oxidizes most organic material it comes in contact with, thereby destroying many pathogenic microorganisms. Ozone is considered to be safer than chlorine because, unlike chlorine which has to be stored on site (highly poisonous in the event of an accidental release), ozone is generated on-site as needed. Ozonation also produces fewer disinfection by-products than chlorination. A disadvantage of ozone disinfection is the high cost of the ozone generation equipment and the requirements for special operators.

(Source: http://en.wikipedia.org/wiki/Sewage_treatment)

5. Ventilation

Ventilation is very important in an energy-efficient home. Air sealing techniques can reduce air leakage to the point that contaminants with known health effects such as formaldehyde, volatile organic compounds, and radon are sealed into the house. Ventilation also helps control moisture, which can lead to mold growth and structural damage. The American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) has determined that a home's living area should be ventilated at a CFM rate determined by adding 3% of the conditioned space floor area to 7.5 times the number of bedrooms plus one [formula: vent CFM = 0.03A + 7.5 (# bedrooms + 1)] as published by ASHRAE 62.2 in 2013. In a tight home, mechanical ventilation is necessary to achieve this ventilation rate. ASHRAE Standards are revised every three years.

Ventilation strategies. There are three basic ventilation strategies – natural ventilation, spot ventilation, and whole-house ventilation.

Natural ventilation is the uncontrolled air movement in and out of the cracks and small holes in a home. In the past, this air leakage usually diluted air pollutants enough to maintain adequate indoor air quality. Today, we are sealing those cracks and holes to make our homes more energy-efficient, and after a home is properly air sealed, ventilation is necessary to maintain a healthy and comfortable indoor environment. Opening windows and doors also provides natural ventilation, but many people keep their homes closed up because they use central heating and cooling systems year-round.

Natural ventilation is unpredictable and uncontrollable – you can't rely on it to ventilate a house uniformly. Natural ventilation depends on a home's airtightness, outdoor temperatures, wind, and other factors. During mild weather, some homes may lack sufficient natural ventilation for pollutant removal. During windy or extreme weather, a home that hasn't been air sealed properly will be drafty, uncomfortable, and expensive to heat and cool.

Spot ventilation can improve the effectiveness of natural and whole-house ventilation by removing indoor air pollution and/or moisture at its source. Spot ventilation includes the use of localized exhaust fans, such as those used above kitchen ranges and in bathrooms. ASHRAE recommends intermittent or continuous ventilation rates for bathrooms of 50 or 20 cubic feet per minute and kitchens of 100 or 25 cubic feet per minute, respectively.

The decision to use **whole-house ventilation** is typically motivated by concerns that natural ventilation won't provide adequate air quality, even with source control by spot ventilation. Whole-house ventilation systems provide controlled, uniform ventilation throughout a house. These systems use one or more fans and duct systems to exhaust stale air and/or supply fresh air to the house.

There are four types of systems:

- **Exhaust ventilation systems** work by depressurizing the building and are relatively simple and inexpensive to install.
- **Supply ventilation systems** work by pressurizing the building, and are also relatively simple and inexpensive to install.
- **Balanced ventilation systems**, if properly designed and installed, neither pressurize nor depressurize a house. Rather, they introduce and exhaust approximately equal quantities of fresh outside air and polluted inside air.
- **Energy recovery ventilation systems** provide controlled ventilation while minimizing energy loss. They reduce the costs of heating ventilated air in the winter by transferring heat from the warm inside air being exhausted to the fresh (but cold) supply air. In the summer, the inside air cools the warmer supply air to reduce ventilation cooling costs.

(Source: http://www.energy.gov/energysaver/articles/ventilation)

6. Central Air Conditioning

Central air conditioners circulate cool air through a system of supply and return ducts. Supply ducts and registers (i.e., openings in the walls, floors, or ceilings covered by grills) carry cooled air from the air conditioner to the home. This cooled air becomes warmer as it circulates through the home; then it flows back to the central air conditioner through return ducts and registers.

Air conditioners help to dehumidify the incoming air, but in extremely humid climates or in cases where the air conditioner is oversized, it may not achieve a low humidity. Running a dehumidifier in your air conditioned home will increase your energy use, both for the dehumidifier itself and because the air conditioner will require more energy to cool your house.

Types of Central Air Conditioners. A central air conditioner is either a split-system unit or a packaged unit. In **a split-system** central air conditioner, an outdoor metal cabinet contains the condenser and compressor, and an indoor cabinet contains the evaporator. In many split-system air conditioners, this indoor cabinet also contains a furnace or the indoor part of a heat pump. The air conditioner's evaporator coil is installed in the cabinet or main supply duct of this furnace or heat pump. If your home already has a furnace but no air conditioner, a split-system is the most economical central air conditioner to install.

In **a packaged central air conditioner**, the evaporator, condenser, and compressor are all located in one cabinet, which usually is placed on a roof or on a concrete slab next to the house's foundation. This type of air conditioner also is used in small commercial buildings. Air supply and return ducts come from indoors through the home's exterior wall or roof to connect with the packaged air conditioner, which is usually located outdoors. Packaged air conditioners often include electric heating coils or a natural gas furnace. This combination of air conditioner and central heater eliminates the need for a separate furnace indoors.

(Source: http://www.energy.gov/energysaver/articles/central-air-conditioning)

7. Passive Solar Building

One of the latest trends in energy conservation is passive solar building design. This means making windows, walls and floors in such a way that they are able to collect, store and distribute solar energy (heat) in winter and reject it in summer. This kind of design implies avoiding the use of mechanical and electrical devices. The best way to design a passive solar building is to pay great attention to window placement, glazing type, thermal insulation, thermal mass and

shading. In most cases these design techniques are applied to new buildings, but even existing buildings can be adapted. If emissions decrease, this will help to reduce climate change. Energy conservation makes the replacement of non-renewable resources with renewable energy easier. According to the European Union pledges of 2006, the annual consumption of primary energy in the EU should be reduced by 20% by 2020. The EU's SAVE Programme is expected to promote energy efficiency and encourage energy-saving behaviour. The European Commission is currently giving financial support to large-scale research projects that will try to understand the factors of effective energy conservation programmes.

(Source: Flash on English for Construction)

8. Bio-architecture: General Definitions

Bio-architecture is a new building approach that respects life and earth. Its aim is to create 'healthy' buildings with little ecological impact, creating harmony between buildings and nature. For this reason two basic principles have to be followed:

• using the natural presence of the sun, good thermal insulation and natural ventilation to reduce energy consumption;

• using renewable energy resources (solar, wind, water and geothermal) to achieve energy autonomy.

Bio-architects and designers follow the principles of natural design that rule all nature, so by studying and understanding the regularity and balance that we can find in nature, they try to establish rules that can be applied to architecture. They use special geometric shapes, symmetries, proportions, natural patterns and universal symbols to create pleasant and harmonious spaces. Bio-architects follow simple rules that include:

• designing spaces using natural geometries, shapes and growth patterns in order to create sustainable systems;

• avoiding 'negative' forms such as sharp angles, and creating harmonious spaces;

• using all kinds of biological materials and avoiding steel, aluminium and plastics when possible.

(Source: Flash on English for Construction)

9. Eco-materials

The materials used in bio-architecture should be chosen paying attention to the damage (production of toxic gases, water and soil pollution) that they may cause to the environmental ecosystem. Eco-materials should:

- be biodegradable and recyclable;
- not be dangerous for our health;
- contribute to a more sustainable environmental future.

Examples of materials that can be used in bio-architecture are timber, brick, stone, cork and natural paints and varnishes. It is easy to choose eco-friendly materials thanks to certifications.

(Source: Flash on English for Construction)

10. Sustainable Design

The main goals in designing an environmentally-friendly building are:

• **Reduction of energy consumption**: one of the strategies used by designers to decrease the use of energy is good insulation in walls, floors and ceiling and energy efficient windows with double glazing. Another approach is to orient walls and windows so as to make the most of the use of natural light (so decreasing the use of electric lighting when daylight is available) and place trees and sun shelters in effective positions to provide shade in the summer. Another way to decrease energy costs is through the use of solar water heating, so the environmental impact of the building can be further reduced.

• **Reduction of water consumption and protection of water quality**: this can be attained through facilities that improve the collection, purification and reuse of water. Low-flow taps and ultra-low flush toilets can also be used to reduce waste water.

• **Improving air quality and ventilation systems**: indoor air quality can be improved during the design and construction processes by choosing construction materials and interior finish products with zero or low VOC emissions. The control of moisture accumulation, thanks to well-insulated envelope and adequate ventilation is also very important for the health of those living in a building. The choice of flooring is important too. Wood is hypo-allergenic and, by using smooth surfaces, the creation of unhealthy particles can be avoided.

(Source: Flash on English for Construction)

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