ДОНСКОЙ ГОСУДАРСТВЕННЫЙ ТЕХНИЧЕСКИЙ УНИВЕРСИТЕТ

УПРАВЛЕНИЕ ДИСТАНЦИОННОГО ОБУЧЕНИЯ И ПОВЫШЕНИЯ КВАЛИФИКАЦИИ

Кафедра «Иностранных языков»

Методические указания

по обучению профессионально-ориетированному чтению по дисциплине

«Английский язык»

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Аннотация

Методические указания предназначены для аспирантов специальности 05.23.04 - Водоснабжение, канализация, строительные системы охраны водных ресурсов. Содержат тексты для разного вида чтения и перевода научного текста на профессионально-ориентированную тематику, а так же серию лексико-грамматических упражнений.

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Оглавление

PART I Sanitary Engineering. General Considerations .. 4
Unit 1.1 Effects of Sanitary Engineering upon City Life.. 4
Unit 1.2 Work of the Sanitary Engineer 7
Unit 1.3 The Sanitary Survey 8
Part II Water 9
Unit 2.1 Water Supply 9
Unit 2.2 12
Unit 2.3 Consumption for Various Purposes 15
Unit 2.4 Periods of Design and Water Consumption Data Required 17
Part III Sewerage. General Considerations 20
Unit 3.1 Sewerage. Historic background.......................20
Unit 3.2 Sewerage. Definitions....................................23
Unit 3.3 Sources of Sewage 24
Unit 3.4 Infiltration and Inflow....................................26
Список литературы 29

PART I SANITARY ENGINEERING. GENERAL CONSIDERATIONS

Unit 1.1 Effects of Sanitary Engineering upon City Life

Discuss in pairs:

1) Does Sanitary Engineering influence city life? How?
2) What is the important effect of waterworks upon cities?

Read the text and see if your ideas are right.

The bills of mortality of London in the seventeenth century, which were the vital statistics of the day, indicate that the death rate in large cities at that time was greater than the birth rate. Cities, therefore, grew slowly and only by migration from country to city. This condition can be ascribed to prevailing insanitary conditions combined with crowding of people into a small area and the resulting prevalence of communicable disease. The first municipal sanitary improvement both in England and elsewhere was the construction of water supplies which, in large cities, were soon followed by sewerage. Small cities and towns have also installed waterworks and sewerage systems during the last few decades, at the present time there are few communities that do not have a public water supply and in most cases a sewer system.

The construction grants program of EPA (Environmental Protection Agency) and, earlier, the Federal Water Pollution Control Administration (FWPCA), under which the construction of sewage works is largely financed by federal funds, has hastened the construction of collection and treatment systems in communities which had lacked them.

EPA is also charged with ensuring the provision of suitable drinking water and, as successor to the U.S. Public Health Service (USPHS), is conducting research into the health effects of minute concentrations of various contaminants and has established water quality standards for public water supplies.

The important effects of waterworks and sewerage upon cities are not confined to safeguarding of health. Safety of life and property against fire has been obtained. Street cleaning and flushing are possible. Swimming pools, fountains, and other ornamental and recreational uses of water are now commonplace. Industries will locate in cities where they are assured of an ample supply of water and where there are sewers to remove their liquid wastes. Some industries, and this should be recognized by municipal authorities, may make unreasonably high demands for water or may produce wastes which are unsuitable for joint treatment and disposal.

The unthinking citizen, accustomed to the comforts of civilization, has little conception of the significance of the stream of water that he obtains when he turns on a tap and even less of the vast network of underground conduits available to receive that water as it escapes into the drainpipe.

1. Notes to the text:

mortality – смертность
vital – жизненный
disease – болезнь
to be charged with – нести ответственность за
contaminant – загрязнение
waste – сточные воды (отходы)
tap – кран
drainpipe – сточная труба (канализация)

2. Match two columns and make the collocations:

1) vital	a) rate
2) bill of	b) sewerage systems
3) death	c) disease
4) insanitary	d) statistics
5) communicable	e) mortality
6) installed	f) conditions
g) waterworks	

3. Match the following English expressions to their Russian ones:

1) to indicate the death rate	a) федеральное финансирование
2) construction of sewage works	b) строительство очистных сооружений
3) federal funds	c) указывать на уровень смертности
4) suitable drinking water	d) сооружение канализации
5) construction of collection and treatment systems	e) пригодная питьевая вода

4. Read the text again and answer the questions:

1) What was the vital statistics of the day in London in 17th century?

2) What was the first municipal sanitary improvement in England?

3) What does FWPCA mean?
4) What is the function of FWPCA?
5) What is EPA charged with?
6) What are ornamental and recreational uses of water in cities?

5. Read the following statements and say whether they are true or false (T/F). If they are false, correct them.

1) The bills of mortality of London in the 17th century didn't indicate that the death rate in large cities at that time was greater than the birth rate.
2) The first municipal sanitary improvement in England was the construction of sewerage.
3) The Federal Water Pollution Control Administration is charged with constructing of collection and treatment systems in communities.
4) The important effects of waterworks and sewerage are confined only to safeguarding of health.
5) Some industries may make unreasonably high demands for water.

6. Look through the text and find in the text English equivalents for the following words and word combinations:

1) сводка смертности
2) жизненно-важная статистика
3) уровень рождаемости
4) антисанитарные условия
5) инфекционное заболевание
6) водоснабжение
7) канализация
8) обеспечение питьевой водой
9) загрязнитель
10) нормы качества общественного водоснабжения

7. Discuss in pairs:

1) Vital importance of public water supply and sewerage systems.
2) The first municipal sanitary improvement in the 17th century.
3) The functions of EPA, FWPCA and USPHS.

Unit 1.2 Work of the Sanitary Engineer

Read the text and answer the following questions:

1) What is the significance of sanitary engineering in the growth of cities?
2) What made the task of sanitary engineering more complex?
3) What are the responsibilities of sanitary engineer?

The development of sanitary engineering has paralleled and contributed to the growth of cities. Without an adequate supply of safe water, the great city could not exist, and life in it would be both unpleasant and dangerous unless human and other wastes were promptly removed. The concentration of population in relatively small areas has made the task of the sanitary engineer more complex. Groundwater supplies are frequently inadequate to the huge demand and surface waters, polluted by the cities, towns, and villages on watersheds, must be treated more and more elaborately as the population density increases. Industry also demands more and better water from all available sources. The rivers receive ever-increasing amounts of sewage and industrial wastes, thus requiring more attention to sewage treatment, stream pollution, and the complicated phenomena of self-purification.

The public looks to the sanitary engineer for assistance in such matters as the control of malaria by mosquito control, the eradication of other dangerous insects, rodent control, collection and disposal of municipal refuse, industrial hygiene, and sanitation of housing and swimming pools. The activities just given, which are likely to be controlled by local or state health departments, are sometimes known as public health or environmental engineering, terms which, while descriptive, are not accepted by all engineers. The terms, however, are indicative of the important place the engineer holds in the field of public health and in the prevention of diseases.

1. Read the text again and give the summary of it using the following phrases:

- The text is devoted to…
- It is recognized that…
- The text puts forward the idea that…

Unit 1.3 The Sanitary Survey

Read the text and word the main idea of it.

A survey of all surroundings and conditions that may affect the quality of a water supply is highly important. For state certification of a supply a favorable survey report is required, in addition to a satisfactory bacteriological test.

Carriers are persons who harbor disease germs and excrete them in body discharges but show no signs of disease. A considerable proportion of all persons having typhoid fever become temporary or permanent carriers. They can be discovered by a laboratory test. No one having had typhoid should be allowed to prepare food for the public unless tested and shown not to be a carrier. Surveys are that they will find conditions that are potential sources of contamination and waterborne epidemics, that when bacteriological testing of the water indicates pollution, a survey may find the danger, and that the survey is a necessity for proper interpretation of bacteriological tests. Difficulties frequently arise in connection with single water samples from small well supplies that show presence of coliforms. A sanitary survey may indicate that they are probably of nonfecal origin and that such drastic action as condemnation of the supply is not justified. Hasty action in condemnation is especially likely to cause adverse criticism if the water has been consumed regularly without causing disease. Sanitary surveys require judgment and technical knowledge. Operational procedures and techniques for correcting defects are discussed in the following articles.

1. Read the text again and give the title to it.

PART II WATER

Unit 2.1 Water Supply

Discuss in pairs:

1) What were responsibilities of the earlier waterworks engineers?

2) Why did the treatment methods develop?

Read the text and see if your ideas are right.

Throughout recorded history large cities have been concerned with their water supply. Even ancient cities found that local sources of supply—shallow wells, springs, and brooks—were inadequate to meet the very modest sanitary demands of the day, and the inhabitants were constrained to build aqueducts which could bring water from distant sources. Such supply systems could not compare with modern types, for only a few of the wealthier people had private taps in their homes or gardens, and most citizens carried water in vessels to their homes from fountains or public outlets. Medieval cities were smaller than the ancient cities, and public water supplies were practically nonexistent. The existing aqueducts of ancient Athens, Rome, and the Roman provincial cities fell into disuse, and their purposes were even forgotten.

The waterworks engineer of ancient times labored under the severe handicap of having no type of pipe that could withstand even moderate pressures. He used pipe of clay, lead, and bored wood in small sizes, but even with these, as with masonry aqueducts and tunnels, he followed the hydraulic grade line and rarely placed conduits under pressure.

In the seventeenth century the first experiments were made with cast-iron pipe but it was not until the middle of the eighteenth century that these pipes were cheap enough for wide use. The durability of cast iron and its freedom from breaks and leakages soon made its use almost universal, although steel and other materials were also used. This advance, together with improved pumping methods, made it economically possible for all but the smallest villages to obtain water supplies and to deliver the water into the homes of the citizens.

Although some cities were able to collect safe water from uninhabited regions and thereby reduce waterborne disease to a low level, many others found that their supplies were dangerously polluted and that the danger was increasing as population increased upon watersheds. Accordingly treatment methods were developed that, when properly applied, reduced the hazard.

Coagulants have been used in water treatment since at least 2000 B.C., as has filtration, however their use in municipal treatment in the United States was not common until about 1900. The application of various treatment techniques in the early part of the twentieth century resulted in the marked decrease in waterborne disease .

Philadelphia's water supply came, without treatment of any kind, from increasingly polluted rivers until 1906, when slow sand filters were completed. An immediate reduction in typhoid fever followed over a period of 7 years. A tendency to increase, possibly caused by further increases in the pollution of the untreated water, was checked by disinfection of the filtered water with chlorine. A still greater decrease was accomplished after 1920 by careful control over infected persons who had become carriers.

1. Notes to the text:

to meet sanitary demands – отвечать санитарным требованиям
to withstand moderate pressure – выдерживать умеренное давление
clay – глина
lead – свинец
bored wood – полое дерево
masonry – каменная кладка
coagulant – коагулянт
hydraulic grade line – линия гидравлического уклона
durability – прочность
leakage – утечка, просачивание

2. Match the words in two columns and make the collocations:

1) to meet	a) tap
2) distant	b) pipe
3) private	c) disuse
4) public	d) sanitary demands
5) to fall into	e) sources
6) cast-iron	f) outlet

3. Match the following English expressions to their Russian ones:

1) shallow wells	a) методы очистки

2) springs and brooks	b) места общего пользования
3) public outlets	c) мелкие колодцы
4) dangerously polluted	d) ручьи
5) treatment methods	e) опасно зараженные

4. Read the text again and answer the questions:

1) Were local sources of water supply in ancient cities satisfactory?

2) Who could afford to have a private tap in ancient time?

3) Why were public water supplies practically nonexistent at Earlier time?

4) What were the difficulties of ancient waterworks engineer?

5) What building materials were used in the construction of water pipe?

6) What material made the water pipe use universal?

7) What advances made it economically possible for all to obtain water supplies?

5. Read the following statements and say whether they are true or false (T/F). If they are false correct them. Use the following phrases:

- That's right…
- No objections…
- I don't think it's right…
- That's wrong…
- According to the text…

1) In ancient cities local sources of supply met sanitary demands of the day.

2) The purpose of existing aqueducts of ancient Athens, Rome and the Roman provincial cities were forgotten.

3) The water works engineer of ancient times didn't follow the hydraulic grade line.

4) In the 18th century the first experiments were made with cast-iron pipe.

5) The durability of cast iron made its use almost universal.

6) Coagulants have been used in water treatment at least 2000 b.c.

6. Look through the text and find in the text English equivalents for the following words and word combinations:

1) городская очистка

2) методы очистки

3) болезнь, переносимая водой
4) загрязненные реки
5) уменьшить опасность
6) подавать воду в дома
7) полое дерево
8) акведуки из каменной кладки
9) помещать трубы под давлением
10) широкое использование

7. Discuss in pairs:
1) Ancient sources of water supply.
2) The range of the ancient water work engineer's job.
3) Water Treatment Techniques.

Unit 2.2

Discuss in pairs:
1) What is it necessary to do in the design of waterworks project?
2) What are the periods of such design?

Read the text and see if your ideas are right. Give your title to the text.

In the design of any waterworks project it is necessary to estimate the amount of water that is required. This involves determining the number of people who will be served and their per capita water consumption, together with an analysis of the factors that may operate to affect consumption.

It is usual to express water consumption in liters or gallons per capita per day, obtaining this figure by dividing the total number of people in the city into the total daily water consumption. For many purposes the average daily consumption is convenient. It is obtained by dividing the population into the total daily consumption averaged over one year. It must be realized, however, that using the total population may, in some cases, result in serious inaccuracy, since a large proportion of the population may be served by privately owned wells. A more accurate figure would be the daily consumption per person served.

Prior to design of a waterworks one must establish the length of time the improvement will serve the community before it is abandoned or enlarged.

For example, an impounding reservoir may be constructed of such capacity that it will furnish a sufficient amount of water for 30 years, or the capacity of a water purification plant may be adequate for 10 years. These periods are known as periods of design, and they have an important bearing upon the amount of funds that may be invested in construction of both waterworks and sewerage works. Since most American cities are growing in population, the period of design depends mainly upon the rate of population growth; i.e., the water purification plant mentioned above will just serve the population expected 10 years hence. The problem, accordingly, is to forecast as accurately as possible the population 10, 20, or 30 years in the future.

One source of population figures is the U.S. Bureau of the Census, which makes decennial counts and publishes reports covering its enumerations. While the Census Reports give the data upon which to base estimates of population, it is frequently necessary to estimate present population in a year subsequent to the last decennial census. Finding present population is sometimes done by plotting the line of population increase as shown by the last two preceding enumerations and continuing the line to the year in question. Population figures shown by city directories may also be used. Possibly the best method is to obtain the ratio of population to the number of children in the schools or to the number of telephone services in the census year and apply the same ratio to the number of school children or services of the present year.

It is more difficult to estimate the population in some future year. Several methods are used, but it should be pointed out that judgment must be exercised by the engineer as to which method is most applicable. A knowledge of the city and its environs, its trade territory, whether or not its industries are expanding, the state of development in the surrounding country, location with regard to rail or water shipment of raw materials and manufactured goods will all enter into the estimation of future population. Of course, extraordinary events, such as discovery of a nearby oil field or sudden development of a new industry, upset all calculations of future growth and necessitate hasty extension of existing water and sewage facilities.

1. Notes to the text:

to estimate – оценивать
per capita – на душу населения
inaccuracy – неточность
directory – справочник

2. Match the words in columns and make the collocations:

1) water	a) population
2) sewage	b) facilities
3) to affect	c) plant
4) daily	d) consumption
5) total	e) reservoir
6) impounding	
7) water purification	

3. Match the following English expressions to their Russian ones:

1) amount of water	a) мощность
2) the number of people	b) количество воды
3) to affect consumption	c) темпы роста населения
4) total population	d) влиять на потребление
5) capacity	e) количество людей
6) rate of population growth	f) общее количество населения

4. Read the text again and answer the questions:

1) What is water consumption expressed in?
2) May the total population result in serious inaccuracy?
3) What must one establish in the design of a waterworks?
4) What does the period of design depend upon?
5) What is one of sources of population in the USA?
6) How can city directories be used?

5. Read the following statements and say whether they are true or false (T/F). If they are false correct them. Use the following phrases:

- It's true…
- No objections…
- It's false…
- According to the text…

1) The design of any waterworks project involves determining the number of people who will be served.
2) The average daily consumption is inconvenient.
3) Using the total population often result in serious inaccuracy.
4) The capacity of a water purification plant may be adequate for 10 years.
5) Periods of design don't have an important bearing upon

the amount of funds invested in construction of waterworks.

6) The period of design depends upon the rate of population growth.

7) Water purification plant will serve the population expected 10 years.

6. Look through the text and find in the text English equivalents for the following words and word combinations:

1) определение количества человек
2) выражать потребление воды в литрах или галлонах
3) на душу населения в день
4) среднее потребление воды в день
5) колодцы в частном владении
6) увеличение сообщества
7) водоочистительные сооружения
8) прогноз
9) источник населения
10) соотношение количества населения к количеству детей

7. Discuss in pairs:

1) Necessary data base in the design of any waterworks.
2) Factors influencing the periods of waterworks design.

Unit 2.3 Consumption for Various Purposes

Read the text and answer the following questions:

1) What are the main uses of water furnished to a city?
2) What practice may have a considerable effect upon total water consumption?
3) What are industrial water requirements?
4) Does the actual amount of water used for extinguishing fires greatly figure in the average consumption?
5) What type of water is classified as "unaccounted for"?
6) What are the reasons of "unaccounted for" water?
7) What is the percentage of the "unaccounted for" water in a system?

The water furnished to a city can be classified according to its ultimate use or end. The uses are:

Domestic. This includes water furnished to houses, hotels, etc., for sanitary, culinary, drinking, washing, bathing, and other purposes. It varies according to living conditions of consumers, the range usually being considered as 75 to 380 1 (20 to 100 gal) per capita per day, averaging 190 to 340 1 (50 to 90 gal) per capita. These figures include air conditioning of residences and irrigation or sprinkling of privately owned gardens and lawns, a practice that may have a considerable effect upon total consumption in some parts of the country. The domestic consumption may be expected to be about 50 percent of the total in the average city; but where the total consumption is small, the proportion will be much greater.

Commercial and Industrial. Water so classified is that furnished to industrial and commercial plants. Its importance will depend upon local conditions, such as the existence of large industries, and whether or not the industries patronize the public waterworks.. Self-supplied industrial water requirements are estimated to be more than 200 percent of municipal water supply demand.

Public Use. Public buildings, such as city halls, jails, and schools, as well as public service—flushing streets and fire protection—require much water for which, usually, the city is not paid. Such water amounts to 50 to 75 1 per capita. The actual amount of water used for extinguishing fires does not figure greatly in the average consumption, but very large fires will cause the rate of use to be high for short periods.

Loss and Waste. This water is sometimes classified as " unaccounted for," although some of the loss and waste may be accounted for in the sense that its cause and, amount are approximately known. Unaccounted-for water is due to meter and pump slippage, unauthorized water connections and leaks in mains. It is apparent that the unaccounted-for water, and also waste by customers, can be reduced by careful maintenance of the water system and by universal metering of all water services. In a system 100 percent metered and moderately well maintained, the unaccounted-for water, exclusive of pump slippage, will be about 10 percent.

The total consumption will be the sum of the foregoing uses and the loss and waste.

1. Read the text again and give the summary of it using the following phrases:

- The text deals with…
- It covers such points as…
- It is pointed out that…
- The information is of (no, little, great) interest to…

Unit 2.4 Periods of Design and Water Consumption Data Required

Discuss in pairs:

1) What factors does the design period depend on?
2) How long can be the design period?

Read the text and see if your ideas are right.

The economic design period of a structure depends upon its life, first cost, ease of expansion, and likelihood of obsolescence. In connection with design, the water consumption at the end of the period must be estimated. Overdesign is not conservative since it may burden a relatively small community with the cost of extravagant works designed for a far larger population. Different segments of the water treatment and distribution systems may be appropriately designed for differe periods of time using differe capacity criteria.

1. Development of source. The design period will depend upon the source. For groundwater, if it is easy to drill additional wells, the design period will be short, perhaps 5 years. For surface waters requiring impoundments, the design period will be longer, perhaps as much as 50 years. The design capacity of the source should be adequate to provide the maximum daily demand anticipated during the design period, but not necessarily upon a continuous basis.

2. Pipe lines from source. The design period is generally long since the life of pipe is long and the cost of material is only a portion of the cost of construction. Twenty-five years or more would not be unusual. The design capacity of the pipe line should be based upon average consumption at the end of the design period with consideration being given to provision of suitable velocities under all anticipated flow conditions.

3. Water treatment plant. The design period is commonly 10 to 15 years since expansion is generally simple if it is considered in the initial design. Most treatment units will be designed for average daily flow at the end of the design period since overloads do not result in major losses of efficiency. Hydraulic design should be based upon maximum anticipated flow.

4. Pumping plant. The design period is generally 10 years since modification and expansion are easy if initially considered. Pump selection requires knowledge of maximum flow including fire demand, average flow, and minimum flow during the design period.

5. Amount of storage. The design period may be influenced by cost factors peculiar to the construction of storage vessels, which dictate a minimum unit cost for a tank of specific size. Design

requires knowledge of average consumption, fire demand, maximum hour, maximum week, and maximum month, as well as the capacity of the source and pipe lines from the source.

6. Distribution system. The design period is indefinite and the capacity of the system should be sized to accommodate the maximum anticipated development of the area served. Anticipated population densities, zoning regulations, and other factors affecting per capita flow should be considered. Maximum hourly flow including fire demand is the basis for design.

1. Notes to the text:

Obsolescence – моральный износ
to drill – бурить
velocity – скорость
flow – поток
expansion – расширение
overload – чрезмерная нагрузка

2. Match the words in two columns and make the collocations:

1) water	a) demand
2) distribution	b) wells
3) to drill	c) capacity
4) ground	d) system
5) surface	e) treatment
6) daily	f) water
7) design	

3. Match the following English expressions to their Russian ones:

1) first cost	a) подземные воды
2) surface water	b) обеспечивать
3) criteria	c) первичные затраты
4) ground water	d) система распределения
5) distribution system	e) критерии
6) to provide	f) наземные воды

4. Read the text again and answer the questions:

1) What is the purpose of water treatment and distribution systems design?
2) What is the design period for surface water?
3) What should the design capacity of the pipe line be based

upon?

4) What is hydraulic design based upon?
5) What does pump selection require?
6) How should the distribution system be sized to?

5. Complete the following sentences using the text:

1) Different segments of the water treatment and distribution systems are designed for…
2) The design capacity of the pipe line should be based upon…
3) The economic design period of a structure depends upon…
4) Pump selection requires knowledge of…
5) Maximum hourly flow is…

6. Look through the text again and find English equivalents for the following words and word combinations:

1) насосная станция
2) трубопровод
3) очистительное сооружение
4) распределительная система
5) запроектированная мощность источника
6) природная скорость
7) условия потока воды
8) потеря эффективности
9) видоизменение и расширение
10) факторы стоимости

7. Discuss in pairs:

1) Required data to waterworks design.
2) Key elements of pumping plant construction.

PART III SEWERAGE. GENERAL CONSIDERATIONS

Unit 3.1 Sewerage. Historic background.

Discuss in pairs:

1) What time do sanitary sewers date to?
2) What improvement caused a sharp decline in the urban death rate?

Read the text and see if your ideas are right.

Remains of sanitary sewers are to be found in the ruins of the ancient cities of Crete and Assyria. Rome also had sewers, but they were primarily drains to carry away storm water. It was the practice to deposit all sorts of refuse in the streets, and accordingly the storm sewers also carried much organic matter at times. Sewerage was practically unknown during the Middle Ages, and construction of sewers was not resumed until modern times. At first, these were storm sewers not intended to carry domestic sewage. As late as 1850, the discharge of household wastes into the sewers of London was forbidden. The water courses in or near towns apparently were used as convenient places of refuse disposal, for many writers comment upon the offensive condition of the London brooks, with their burden of dead dogs and filth of all sorts. In the course of time it was recognized that sanitation would best be served by permitting the use of sewers to convey human excreta away from dwellings as promptly as possible, and the original storm drains became combined sewers which carried both storm-water runoff and the liquid wastes from occupied buildings. The development of water supplies, of course, played a large part in the greater use of plumbing systems with water-flush toilets. The commonly used vault toilets, which frequently overflowed and always produced odors, were soon legislated out of existence in the larger cities in favor of the water-carried system. This improvement together with safer water supplies caused a sharp decline in the urban death rate.

When the problem of sewage treatment first attracted attention, a difference of opinion existed among engineers, as to the completeness of treatment that should be given to sewage before discharge into a body of water. Some engineers maintained that the public interest required the most complete treatment possible. Others held the opinion that treatment should be based upon local conditions and that no more treatment need be provided than would give reasonable assurance, with a factor of safety, that danger and nuisance would not exist. So far as safety of water supplies is concerned, this viewpoint placed upon the waterworks authorities some of the burden of safeguarding and treating their raw water. When it is considered that water of streams and lakes may often be polluted or made unsuitable for use otherwise than by city sewage, it is obviously inequitable to require all cities to produce a sewage treatment plant effluent comparable to drinking water. Therefore, sewage treatment has been based upon local conditions rather than idealistic standards.

Present regulations in the United States establish which bodies of water are quality, and which effluent limited. Those waters which are of a quality suitable for their highest intended use are defined as effluent limited. Wastes discharged into such waters must be treated to the degree obtained in secondary systems. Waters which are not suitable for their highest intended use under such effluent limitations are governed by water quality and are analyzed to establish the allowable total pollution load which can be assimilated without degradation. This allowable waste load is then allocated to present and future discharges. Treatment at each discharge point is then tailored to meet this waste load allocation. Treatment to a level less than that provided by secondary systems is never permitted under either system.

1. Notes to the text:

drain – сточная канава
refuse – отходы
disposal – сброс, удаление нечистот
to pollute – загрязнять

2. Match the words in two columns and make the collocations:

1) sanitary	a) matter
2) storm	b) wastes
3) to deposit	c) sewage
4) organic	d) sewers
5) domestic	e) water
6) household	f) refuse

3. Match the following English expressions to their Russian ones:

1) to carry domestic sewage	a) сброс отходов домашнего хозяйства
2) discharge of household waste	b) жидкие отходы
3) storm water runoff	c) запах

4) liquid waste — d) переносить бытовые отходы
5) odor — e) ливневый сток

4. Read the text again and answer the questions:

1) What type of sewers did Rome have?
2) Was sewerage known in the Middle Ages?
3) What were storm sewers intended to carry?
4) When was the discharge of household wastes into the sewers of London forbidden?
5) What were the combined sewers intended for?
6) What development played a large part in use of plumbing system?

5. Read the following statements and say whether they are true or false (T/F). If they are false correct them. Use the following phrases:

- That's right…
- No objections…
- I don't think it's right…
- That's wrong…
- According to the text…

1) Vault toilets existed in large cities for a long time.
2) Water-carried system didn't improve town sanitation.
3) Sewage treatment has been based upon local conditions.
4) Waters which are of a quality suitable for their highest intended use are defined as effluent limited.

6. Look through the text and find in the text English equivalents for the following words and word combinations:

1) остатки канализационных систем
2) складировать все виды отходов
3) ливневая канализация
4) канализация бытовых отходов
5) первые ливневые стоки
6) водопроводная система
7) уровень смертности в городе
8) полная очистка

7. Discuss in pairs:

1) Different types of ancient sewers.
2) Different engineer's views on sewage treatment.

Unit 3.2 Sewerage. Definitions

Read the text and give the title to it. Word the main idea of the text.

As cities have grown, the more primitive methods of excreta disposal have given place to the water-carried sewerage system. Even in small towns the greater safety of sewerage, its convenience, and freedom from nuisance have caused it to be adopted wherever finances permit.

Sewerage implies the collecting of wastewaters from occupied areas and conveying them to some point of disposal. The liquid wastes will require treatment before they can be discharged into a body of water or otherwise disposed of without endangering the public health or causing offensive conditions.

Sewage is the liquid conveyed by a sewer. It may consist of any one or a mixture of liquid wastes which will be separately defined. Sanitary sewage, also known as domestic sewage, is that which originates in the sanitary conveniences of a dwelling, business building, factory, or institution. Industrial waste is a liquid waste from an industrial process, such as dyeing, brewing, or papermaking. Storm sewage is liquid flowing in sewers during or following a period of rainfall and resulting there from. Infiltration is the water that has leaked into sewers from the ground. Inflow is water which enters sewers from surface sources such as cracks in manholes, open cleanouts, perforated manhole covers, and roof drains or basement sumps connected to the sewers. Inflow occurs only during runoff events.

A sewer is a pipe or conduit, generally closed but normally not flowing full, for carrying sewage. A common sewer is one in which all abutting properties have equal rights of use. A sanitary sewer is one that carries sanitary sewage and is designed to exclude storm sewage, surface water, and groundwater. Usually it will also carry whatever industrial wastes are produced in the area that it serves. It is occasionally, although improperly, called a separate sewer. A storm sewer carries storm sewage, including surface runoff and street wash. A combined sewer в designed to carry domestic sewage, industrial waste, and storm sewage. A sewer s tem composed of combined sewers is known as a combined system, but if storm sewage is carried separately from the domestic and industrial wastes, it is said to be a separate system. The term sewerage is applied to the art of collecting, treating, and disposing of sewage. Sewerage works or sewage works are comprehensive terms covering all the structures and procedures required for collecting, treating, and disposing of sewage.

A house sewer is a pipe conveying sewage from the plumbing system of a single building to a common sewer or point of immediate disposal. A lateral sewer has do other common sewer discharging into it. A submain sewer is one that receives the discharge of a number of lateral sewers. A main sewer, also known as a trunk sewer, receives the discharge of one or more submain sewers. A sewer outfall receives the discharge from the collecting system and conducts it to a treatment plant or point of final disposal. An intercepting sewer is one that cuts transversely a number of other sewers to intercept dry-weather flow, with or without a determined quantity of storm water, if used in a combined system. A relief sewer is one that has been built to relieve an existing sewer of inadequate capacity.

Sewage treatment covers any process to which sewage is subjected in order to remove or alter its objectionable constituents so as to render it less dangerous or offensive. Sewage disposal applies to the act of disposing of sewage by any method. It may be done with or without previous treatment of the sewage.

1. Read the text again and make up a plan of it. Choose the key-words from the text to each point of your plan.

2. Look through the text again and make up a summary of it. Use the following phrases:

- The text deals with…
- It covers such points as…
- It is pointed out that…
- Much attention is given to…

Unit 3.3 Sources of Sewage

Read the text and answer the questions:

1) How are sewers classified?
2) What is called sanitary sewage?
3) What is called industrial waste?
4) What type of sewage carries all kinds of waste?
5) What are sanitary sewage and industrial waste derived from?

Sewage is defined as a combination of (a) the liquid wastes conducted away from residences, business buildings, and institutions; and (b) the liquid wastes from industrial establishments; with (c) such ground, surface, and storm water as may be admitted to or find its way into the sewers. Sewage a is frequently known as sanitary sewage or domestic sewage. Sewage b is usually called industrial waste. Sewers are classified according to the type of sewage that they are designed to carry. Sanitary sewers carry sanitary sewage and the industrial wastes produced by the community and only such ground, surface, and storm water as may enter through poor joints, around manhole covers, and through other deficiencies. Storm sewers are designed to carry the surface and storm water which runs off the area that they serve. Combined sewers carry all types of sewage in the same conduits.

The following discussion has for its purpose the development of methods of estimating the quantity of sewage that is or would be carried by sanitary sewers, i.e., wastes from residences, business buildings, institutions, industrial plants, and such water as may enter incidentally.

Sanitary sewage and industrial waste will obviously be derived largely from the water supply. Accordingly, an estimate of the amount of such wastes to be expected must be prefaced by a study of water consumption, either under present conditions or at some time in the future. The proportion of the water consumed which will reach the sewer, must be decided upon after careful consideration of local conditions. Water used for steam boilers in industries, air conditioning, and that used to water lawns and gardens may or may not reach the sewers. On the other hand, many industrial plants may have their own supplies but discharge their wastes into the sewers. Although the sewage may vary in individual cities from 70 to 130 percent of the water consumed, designers frequently assume that the average rate of sewage flow, including a moderate allowance for infiltration, equals the average rate of water consumption.

1. Look through the text again and complete the following sentences:

1) Sewers are classified according to…

2) The proportion of the water consumed must be decided upon…

3) The sewage may vary in some cities from…to…

4) Designers assume that the average rate of sewage flow equals…

5) Domestic sewage is…

Unit 3.4 Infiltration and Inflow

Discuss in pairs:

1) What is the difference between infiltration and inflow?
2) What factors influence infiltration and inflow?

Read the text and see if your ideas are right.

Infiltration is the water that enters sewers through poor joints, cracked pipes, and the walls of manholes. Inflow enters through perforated manhole covers, roof drains, and drains from flooded cellars during runoff events. Because infiltration may be nonexistent during dry weather, the dry-weather flow may be considered as the sanitary sewage plus the industrial wastes. In wet weather, infiltration will be greatly increased as groundwater levels rise, and may be augmented by the inflow from roofs which reaches the sewers by rain leaders from the roof gutters. Most cities prohibit such connections, but they are sometimes made illegally, and some may remain from a period when they were not forbidden. Some sewers may be located below the groundwater table and therefore have some infiltration at all times. Sewers that are constructed in or close to stream beds are especially likely to have high infiltration.

The amount of infiltration to be expected will depend upon the care with which the sewer system is constructed, the height of the groundwater table, and the character of the soil. Special types of joints tend to reduce the infiltration. A soil that heaves with varying water content will pull joints apart and so permit water to enter. A pervious soil permits easy travel of percolating water to the sewers where it will travel along them until it reaches a crack or open joint. Since conditions of construction and soil differ widely, the infiltration found in sewer systems varies considerably. Sewer size apparently has little effect. The large sewers present more joint length for leakage, but the joints are more likely to be of better workmanship. Infiltration rates are likely to vary from 35 to 115 m3/km of sewer per day (15,000 to 50,000 gal/mi per day) in old systems, but even higher rates have been noted where sewers are below the water table and are poorly constructed. Specifications for sewer projects now limit infiltration to 45 1/km per day per mm of diameter (500 gal/mi per in/day).

Since sewers deteriorate, however, engineers are liberal in estimating the infiltration for design purposes. The figures given are based upon length of the public sewers and do not include the house sewers which extend to the buildings. It should be recognized that they will also permit infiltration, and their construction should be carefully controlled. In order to obtain federal funds for the construction of sewage treatment plants it is necessary to demonstrate that the sewer system does not permit excessive infiltration or inflow.

1. Notes to the text:

infiltration – просачивание, инфильтрация
inflow – приток, втекание
joint – стык
cellar – подвал
gutter – водосточный желоб
to heave – вздуваться, вспучиваться
leakage – утечка
to deteriorate – изнашиваться

2. Match the words in two columns and make the collocations:

1) poor	a) drain
2) cracked	b) event
3) perforated	c) joint
4) roof	d) cellar
5) flooded	e) pipe
6) runoff	f) cover

3. Match the following English expressions to their Russian ones:

1) flow	a) русло потока
2) industrial waste	b) уровень грунтовых вод
3) groundwater level	c) поток
4) stream bed	d) просачивающаяся вода
5) percolating water	e) промышленные отходы

4. Read the text again and answer the questions:

1) Does infiltration exist during dry weather?
2) When does infiltration increase?
3) What does the amount of infiltration depend upon?
4) What factors reduce the infiltration?
5) Does sewer size have a great effect in sewer system?
6) What are infiltration rates?

5. Look through the text again and complete the following sentences:

1) Inflow enters through…
2) The dry weather flow may be considered as…
3) Infiltration may be augmented by…
4) Special types of joints tend to…
5) Infiltration rates vary from…to…

6. Look through the text and find English equivalents for the following words and word combinations:

1) трубопровод с трещинами
2) затопленный подвал
3) подъем уровня грунтовых вод
4) зеркало грунтовых вод
5) меняющееся содержание воды
6) технические условия проекта канализационных систем
7)ограничивать
8) оценивать инфильтрацию
9) общественная канализация
10) канализационные очистные сооружения

7. Discuss in pairs:

1) Factors influencing the amount of infiltration.
2) Infiltration rates and specifications for sewer projects.

СПИСОК ЛИТЕРАТУРЫ

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