ВЫСШЕЕ
ОБРАЗОВАНИЕ

Учебник английского языка

А. И. Бурлак

Учебник английского языка

для студентов архитектурных и инженерно-строительных специальностей вузов

Допущено
Министерством высшего
и среднего специального
образования СССР
в качестве учебника
для студентов строительных
специальностей высших
учебных заведений

Москва «Высшая школа» 1982

ББК 81.2 Англ-9
Б 92

Рецензенты: кафедра иностранных языков Харьковского инженерно-строительного института и канд. филол. наук доц. Зайцева Л. П.

Бурлак А. И.
Б 92 Учебник английского языка: Для студентов архитектурных и инженерно-строительных спец. вузов. — М.: Высш. школа, 1982. — 247 с.
В пер.: 85 к.

В учебнике последовательно реализуется основной методический принцип — комплексное обучение всем видам речевой деятельности. Основной структурной единицей учебника является методический комплекс, представляющий собой тематически законченный раздел. Такая организация материала позволяет эффективно формировать у студентов необходимые умения и навыки. Особенностью учебника является широкое использование диалогической речи, а также комплексное применение ТСО.

Б $\frac{4602010000-370}{001(01)-82}$ 142—82

ББК 81.2 Англ-9
4И (Англ)

ПРЕДИСЛОВИЕ

Настоящий учебник предназначается для студентов архитектурных и инженерно-строительных специальностей вузов, продолжающих изучение английского языка.

Цель учебника — научить студентов читать, понимать и переводить оригинальную литературу по широкому профилю строительного вуза, а также научить их вести беседу, построенную на знакомом лексическом и грамматическом материале, на темы, связанные с их будущей специальностью.

По своим учебным целям и содержанию учебник соответствует требованиям программы по английскому языку для неязыковых специальностей высших учебных заведений, утвержденной Учебно-методическим управлением по высшему образованию МВ и ССО СССР.

В учебнике активизируется около 2500 словарных единиц общенаучной и строительной лексики и реализуется основной методический принцип — комплексное обучение всем видам речевой деятельности. Основной структурной единицей учебника является методический комплекс, представляющий собой тематически законченный раздел — Unit.

Учебник состоит из 27 разделов, каждый из которых рассчитан на 8 часов работы в аудитории и 8 часов самостоятельной работы в кабинетах ТСО и дома.

Отбор текстового материала, взятого в основном из оригинальных источников, был обусловлен как тематической направленностью, так и информативной ценностью текстов с учетом повторяемости терминологической лексики. В большинстве текстов активизируются соответствующие грамматические явления, кроме уже известных ранее из курса средней школы. Тексты носят воспитательный характер, охватывают вопросы общественно-политического, экономического, страноведческого характера, а также профессиональной ориентации.

Каждый раздел включает 4 текста.

Текст А предназначен для изучения лексико-грамматического материала во время аудиторных занятий. Предтекстовые задания направлены на закрепление лексики, в послетекстовых упражнениях, построенных на базе лексики текста А, путем многократного повторения закрепляются грамматические явления. Большое внимание уделено изучению словообразовательных механизмов.

Текст В предназначается для выработки навыка быстрого чтения с постепенным нарастанием темпа чтения от 65 слов до 95—100 слов в минуту.

Текст С предназначен для выработки умения извлекать из текста основную информацию. Оба текста (В и С) рекомендуются для аудиторной работы.

Текст D предназначается для самостоятельной работы, он снабжен упражнениями на выявление глубины понимания прочитанного материала.

Материал, предназначенный для аудирования, систематизирует грамматический материал. После аудирования учебного текста, объяснения и закрепления учебно-речевых ситуаций следует переходить к текстам для домашнего чтения.

Тексты для внеаудиторного чтения можно использовать для обучения реферированию и аннотированию технической литературы, а также для тренировки просмотрового, ознакомительного и изучающего чтения, с тем чтобы научить студента отделять при чтении главное от второстепенного, быстро извлекать из текста основную информацию.

В учебнике много текстов для развития навыков понимания на слух, для

перевода и текстов-диалогов для развития навыков устной речи. Все типы текстов связаны общей тематикой. Последовательность изучения текстового материала может быть изменена преподавателем в зависимости от соображений методического характера.

На качество чтения, в частности на его скорость, оказывает воздействие целенаправленное слушание, которое стимулирует и говорение. Поэтому в структуру учебника легко вписываются диалоги. (По опытно-экспериментальной методике на занятиях в ОИСИ отводилось 50% времени на чтение английских текстов, 25% — на говорение, 20% — на аудирование и 5% — на письмо).

Все виды работы по настоящему учебнику подразделяются на аудиторные, лабораторные и домашние.

Первые занятия рекомендуется проводить только в аудитории. Школьная лексика повторяется на протяжении всего первого семестра, грамматика — в основном в течение первого курса обучения. Преподаватель помогает студентам распознавать языковые явления, выявлять значения незнакомых слов по их грамматической форме и месту в предложении, определять связи между словами в контексте и по их сходству с русскими словами. Работа над основным текстом происходит под руководством преподавателя в аудитории, а проработанная часть текста закрепляется дома путем повторной самостоятельной проработки. Затем студенты в аудитории работают над моделями, различными с точки зрения механизма образования, синтаксических особенностей и лексических наполнений.

При работе с текстами студенты должны научиться работать со словарем. Рекомендуется пользоваться не только словарем учебника, который не может вместить всей терминологии по данной специальности, но и любым другим, более полным, словарем. (В заданиях ссылка на такие словари подчеркивается формулировкой: Use a dictionary...).

Приобретение нового словарного запаса, совершенствование навыков перевода и отработка диалогов осуществляется при использовании записей-эталонов и при выполнении на слух упражнений вопросо-ответного характера к изучаемым текста. Тексты для аудирования рекомендуется записывать на пленку. Выполнение фонограмм желательно осуществлять дикторами — носителями языка или лучшими фонетистами кафедры.

Упражнения на аудирование направлены на развитие механизма осмысления учебного материала, на развитие умения понимать сообщения диктора и перекодировать его, понимать на слух терминологию, фразеологизмы и прочее. После прослушивания пяти — семи предложений текста без его предъявления рекомендуется выразить одним термином содержание прослушанного, а из группы предложений найти одно, главное, предложение, выражающее основную мысль.

Рекомендуется использовать групповые, индивидуальные и парные формы работы, свернутый пересказ, микрореферирование и т. д.

В целях проверки понимания прочитанного рекомендуется составление студентами вопросов к абзацам текста, составление реферата (précis), изложение основной идеи текста или параграфа, задание на перевод или передачу содержания отдельных предложений или текста, самостоятельное конструирование диалогов и другие формы работы.

Чтобы студенты научились составлять диалоги, необходимо чередовать выполнение упражнений с чтением текстов, соблюдая их последовательность.

Грамматический справочник прорабатывается самостоятельно после краткого объяснения соответствующих грамматических явлений преподавателем.

Автор благодарен рецензентам и всем, кто принимал участие в обсуждении рукописи учебника, за ценные замечания, которые помогли автору в работе.

Автор

UNIT 1. HIGHER EDUCATION (I)

Grammar: The Structure of the Sentence (§ 1). Sentences with **There+to be** (§ 5). Present, Past and Future Indefinite Tenses (§ 25). The Verb **to be** (§ 22). Interrogative Sentences (§ 2). Numerals (§ 20). Word-Building (§ 50).

Exercises

I. *Find in the dialogue (Ex. V) the English equivalents for the following words and word-combinations:*

означать, очень много, в четыре раза больше, вместе взятых, конечно, старший брат, готовить, видите ли, ладно, факультет промышленно-гражданского строительства, сантехнический факультет, гидротехнический факультет, архитектурный факультет, факультет конструирования в промышленно-гражданском строительстве

II. *Translate the following into Russian:*

Europe — European, capital — capitalist, technology — technological, engine — engineer — engineering, special — specialist — speciality — specialization — specialize, to please — pleasure — pleasant, industry — industrial — industrious, architect — architecture — architectural, to train — trainer — training

III. *Open the brackets and use the proper tense:*

1. Our Institute (*to train*) specialists at six faculties. 2. My elder brother (*to be*) a research worker at our Institute. 3. Last year his work (*to be*) supervised by Professor N. 4. We (*to have*) many excellent laboratories in this building. 5. A lot of students (*to make*) interesting reports at tomorrow's conference.

IV. *Translate the dialogue into English:*

— Ты учишься на гидротехническом факультете?
— Нет, я учусь на архитектурном.
— А твой старший брат? На каком факультете он учится?
— Мой старший брат учится на сантехническом.

V. *Repeat the tape-recorded dialogue after the speaker:*

A.: The Soviet Union is a country of students, isn't it?
B.: Yes, the Soviet Union is a country of students.

A.: Does that mean that there are a great many students in our country?
B.: There are four times as many students in our country as in all European capitalist countries taken together.
A.: You are also a student, aren't you?
B.: Of course, I am! So is my elder brother.
A.: What specialists does your Institute train?
B.: You see, there are six faculties at our Institute.
A.: Name them, please!
B.: All right, here they are: the Faculty of Industrial and Housing Construction, the Sanitary Engineering Faculty, the Hydro-Engineering Faculty and three others.
A.: I'm sure there's an Architectural Faculty too.
B.: There is! There are also two more faculties.
A.: What are those two faculties?
B.: They are the Technological Faculty and the Faculty of Constructional Engineering.

TEXT 1A. OUR INSTITUTE

Repeat the tape-recorded text after the speaker:

We are students of a large civil engineering institute. It trains civil engineers whose profession embraces many fields. A civil engineer constructs and reconstructs residential and industrial buildings, bridges, schools, palaces of culture, theatres, hospitals, tunnels, dams, etc.

Our Institute was founded in 1930. In those days the student body did not exceed 400 persons. At present the student body of the Institute exceeds 11,000 persons.

The main building was completed in 1965. It houses the library with a spacious reading hall, many classrooms and well-equipped labs, a fine gym, etc.

Many of our teachers and instructors are outstanding specialists in various fields of technology and science. Some of them are graduates of our Institute.

At the beginning of each academic year our first-year students usually go to collective farms, where they help the collective farmers to gather the harvest.

Our second-year students work for a month and ten days on construction sites, where they gain certain experience.

The Institute has four hostels. All of them are within walking distance of the Institute.

In all parts of our vast country, on nearly every major construction site one can find graduates of our Institute.

Exercises

I. *Find in the text the passages to which the questions refer:*

1. What does a civil engineer do? 2. Was our Institute founded in 1925? 3. What was the student body in those days? 4. What is the stu-

dent body of our Institute at present? 5. When was the main building of our Institute completed? 6. What does it house? 7. What can you say about our teachers and instructors? 8. When do our first-year students help the collective farmers to gather the harvest? 9. Where do our second-year students gain certain experience? 10. Is it true that one can find graduates of our Institute on nearly every major construction site?

II. *Make questions of the following statements and then give short answers to each of them:*

1. These students can speak English very well. 2. They play basketball every Saturday. 3. We shall go to the library after classes. 4. George should stay at home this afternoon. 5. Their friends want to go on an excursion with us. 6. You must write him a letter as soon as you return to the hostel. 7. One has to work systematically when learning a foreign language. 8. It isn't advisable to read this article very fast.

III. *Make questions of the following statements. Begin each question with the word(s) given in brackets:*

Model: Alex left at 7 o'clock this morning. (What time ...?)→ **What time** did Alex leave this morning?

1. The men got home around midnight. (What time ...?) 2. They went to the theatre an hour ago. (Where ...?) 3. His father worked at this factory for ten years. (How many years ...?) 4. The girls came here twice, but you were out. (How many times ...?) 5. Pavel went to Leningrad to visit his uncle. (Why ...?) 6. The heavy rain lasted only one hour. (How long ...?) 7. Most of the delegates spoke to us in English. (In what language ...?) 8. Nick's children sat in the first row. (In which row ...?) 9. The conference began at two sharp. (What time ...?) 10. Most of the students take their meals at this canteen. (Where ...?)

IV. *Make the following sentences negative:*

1. We are students of this group. 2. This man is a teacher of chemistry. 3. These young men are civil engineers. 4. Dan and I are very busy this afternoon. 5. Michael and Frank are post-graduates. 6. George is Helen's younger brother. 7. They play chess every Saturday afternoon. 8. Fred works on Sundays. 9. She is fond of folk songs. 10. Alexander wants to help you again.

V. *Change the following from Present to Past Indefinite:*

1. They walk through this park every afternoon. 2. She drinks tea with all her meals. 3. We usually come to the Institute on foot. 4. Edward comes to the Institute by bus. 5. He always talks to us in English. 6. These two boys are old friends. 7. Our English teacher asks us many questions. 8. I come here very rarely.

VI. *Read the following nouns paying attention to the pronunciation of the plural forms. Give corresponding singular forms and translate the words into Russian:*

specialists, lectures, laboratories, text-books, examinations, students, factories, teeth, feet, children, finals, sites, institutes, subjects, classes, men, women, shelves, halves, lives, languages, faculties, girls, boys, data

VII. *State to what part of speech the following words belong according to their suffixes:*

specialist, lecture, physical, library, higher, education, different, equipped, necessary, language, laboratory, builder

VIII. *Read the following sentences and point out the subject and the object in each of them:*

1. At all civil engineering institutes students have lectures and practical hours. 2. On completion of studies the student presents a graduation thesis or takes the finals. 3. Among the student body of any institution of higher learning one can see quite a number of foreign students. 4. Our country requires more and more trained specialists.

IX. *Read the following sentences and point out the predicate in each of them:*

1. Education is free of charge in the Soviet Union. 2. There is a reading hall and a library where the students can take the necessary textbooks. 3. Practical training is conducted in well-equipped laboratories.

TEXT 1B. MORE SPECIALISTS WANTED

Repeat the tape-recorded text after the speaker. Determine the meanings of the words and word-combinations given in bold type:

Our country **requires** more and more specialists with a higher education. In the USSR **the complete course** at most institutes **lasts 5 years.** Education is free of charge and most of the students receive stipends.

At the Civil Engineering institutes students have lectures and practical hours. They attend lectures on[1] different subjects: Mathematics, History of the CPSU, Physics, Chemistry, Foreign Languages, **Descriptive Geometry,** Geodesy, Drawing, etc.[2] They have hours of practical training in the well-equipped laboratories of the institute.

At every institute there is a reading hall and a library, where the students can take the necessary **text-books, as well as**[2] books for reading.

The academic year is divided into two terms from September to January and from February to July.

Students take examinations at the end of each term. On completion of studies the student **presents a graduation thesis**[4] or **takes the finals.**[5] Many of the graduates work at major **construction sites.**

Among **the student body** of any institution of higher learning one can see quite a number of foreign students. After graduation they will return home **full-fledged specialists.**

Notes

1. **to attend lectures on** — посещать лекции по ...

2. **etc.** — и т. д. (сокращение от латинского *et cetera*)
3. **as well as** — так же, как и ...
4. **to present a graduation thesis** — защищать дипломную работу
5. **to take the finals** — сдавать выпускные экзамены

Exercises

I. *Answer the following questions:*

1. Does the complete course at most institutes in the USSR last 5 years? 2. How long does the complete course last at your institute? 3. What lectures do you attend? 4. Where do you get the necessary textbooks? 5. Do you want to work at one of the major construction sites?

II. *Use the correct form of the pronoun in brackets:*

1. We often see (*they*) at the library. 2. He teaches (*we*) the English language. 3. Gleb sends (*she*) letters and post cards from the Crimea. 4. What's the matter with (*he*)? 5. Your new friends live near (*we*). 6. We never refuse to help (*they*). 7. All these technical journals belong to (*she*). 8. I understand (*they*) very well when they speak slowly. 9. They know (*she*) parents. 10. Give (*I*) these newspaper cuttings, please. 11. They want to play football with (*we*). 12. Give (*he*) this book and tell (*he*) to read it from cover to cover.

III. *Transform the following sentences into the negative:*

1. My close friend lived in Moscow two years ago. 2. They worked at a major construction site. 3. This young man was the best athlete a year ago. 4. The boys came home from the stadium very late. 5. You understood everything the teacher said at the lesson. 6. Our basket-ball team played very well on Saturday. 7. The young workers solved all their problems in a week. 8. His brother began to play chess at the age of six. 9. We all enjoyed the concert. 10. I woke up at six o'clock in the morning.

IV. *Give Russian equivalents for the following word-combinations:*

free (free of charge), practical hours, to attend lectures, descriptive geometry, physical training, well-equipped laboratories, as well as, the academic year, to take examinations, a graduation thesis, to take the finals, major construction sites, the student body, one can see, full-fledged specialists

V. *Transform the following sentences into the interrogative:*

1. His brother studies at the University. 2. They work at this factory. 3. The students are going on an excursion the day after tomorrow. 4. Alexander will go to the library with us on Friday. 5. There is a reading hall and a library at every institute. 6. Mary was good at foreign languages when she was a student. 7. The boys were buying the necessary textbooks when Edward saw them. 8. One can see a number of foreign students at nearly every institute in this city.

VI. *Translate the following words and word-combinations into Russian and memorize them so as to be able to write a spelling test:*

the Union of Soviet Socialist Republics, foreign languages, higher education, to require, course, free of charge, receive, grant, scholarship, stipend, to attend lectures, different, subject, mathematics, physics, chemistry, descriptive geometry, drawing, physical training, well-equipped laboratory, to divide, academic year, to take examinations, to complete, graduation thesis, to take the finals

VII. *Ask each other the following questions (involving all the students of the group):*

1. What subjects do you study? 2. How many subjects do you study at present? 3. Do you find mathematics and descriptive geometry very difficult? 4. Where do you usually do your homework? 5. Do you like to do your homework alone or together with a friend? 6. Do you find your homework very difficult? 7. Where do you get the necessary text-books? 8. Do you often borrow books from the library? 9. Which are your favourite subjects? 10. At what time do you get up in the morning on week-days? 11. At what time do you go to bed on week-days? 12. How many hours a day do you spend at the Institute? 13. How long does it take you to do your homework? 14. How long does it take you to get to the Institute? 15. Do you come to the Institute on foot or do you come by bus? 16. Where and when do you have your breakfast? 17. Where and when do you have your dinner and supper? 18. Which newspapers do you like to read? 19. Do you watch TV? 20. Which programmes do you like to watch? 21. How often do you go to the cinema? 22. Do you often go to the theatre? 23. Do you have time to visit exhibitions? 24. What kind of exhibitions appeal to you? 25. Are you fond of pop-music? 26. Do you go in for sport? 27. What are your hobbies?

VIII. *Use the following suggested topics for discussion:*

1. Civil Engineering in the USSR. 2. The Work of a Civil Engineer. 3. The Work of an Architect. 4. The Work of a Hydrotechnician. 5. The Work of a Sanitary Engineer. 6. Your Favourite Subject at the Institute. 7. Foreign Students at Your Institute. 8. Your Future Speciality.

IX. *Give Russian equivalents for the following words without using a dictionary:*

specialist, course, stipend, institute, lecture, mathematics, history, physics, chemistry, geometry, geodesy, physical, practical, laboratory, academic, September, January, February, July, examination, final

X. *Read the following nouns paying attention to the pronunciation of the forms in the plural. Give the corresponding singular form and translate the words into Russian:*

requirements, courses, hours, libraries, text-books, factories, teeth, feet, children, finals, sites, subjects, classes, men, women, shelves, halves, lives, languages, faculties, data

XI. *Read and translate the following sentences at sight:*

1. In the USSR the complete course at most institutes lasts five years. 2. Students attend lectures on different subjects. 3. The students can borrow the necessary textbooks from the library. 4. The academic year is divided into two terms. 5. Students take examinations at the end of each term. 6. After graduation they will return home full-fledged specialists. 7. Our graduates work in different parts of our vast country. 8. They design and construct residential and industrial buildings, bridges, dams, etc. 9. We do not pay for our education because it is free of charge. 10. I shall take my examinations at the end of the term. 11. Have you presented your graduation thesis? 12. Are there many foreign students among the student body of your Institute?

XII. *What is the English for the following:*

требовать, высшее образование, продолжаться, стипендия, инженерно-строительный институт, посещать лекции, предметы, математика, история КПСС, физика, химия, черчение, начертательная геометрия, дипломная работа, сдавать выпускные экзамены, защищать дипломную работу

XIII. *Fill in the blanks with the correct tense of the verbs shown in brackets:*

1. The country ... (*to require*) more and more specialists with a higher education. 2. The complete course at most institutes ... (*to last*) five years. 3. Education in the USSR ... (*to be*) free of charge. 4. The academic year ... (*to be divided*) into two terms. 5. At the end of each term students ... (*to take*) examinations. 6. On completion of studies the students ... (*to present*) a graduation thesis.

XIV. *To what type do the following questions belong:*

1. How many students are there at our Institute? 2. What faculties are there? 3. Are there more than twenty-five students in your group? 4. Most of the students study at the hydrotechnical faculty, don't they? 5. Is the faculty of constructional engineering the largest? 6. Do the students of the faculty of industrial and housing construction study in the morning or in the afternoon? 7. Is it true that the students of the sanitary engineering faculty study in the first shift? 8. Where do most of the students of your group live?

XV. *Translate the following sentences:*

1. He lives in our hostel; I often see him there. 2. If you are looking for your watch, it is over there on my writing table. 3. She reads interesting books to her children in the evening, and they always sit beside her. 4. Do you see them — I mean your students — in the library? 5. Their timetable is very convenient for their studies. 6. His little sister usually plays the piano while he is drawing. 7. Dan likes to paint the window-frames himself.

XVI. *Find the predicate in each sentence of the given text:*

Millions of specialists with a higher or specialized secondary education will be trained. Special attention to providing specialists for areas where productive forces are being intensively developed will be given.

More and better facilities for general educational schools and specialized secondary and higher educational establishments will be provided. Technical aids and new teaching methods in the educational process, including the study of foreign languages will be introduced more actively.

1C. DIALOGUE

Read the dialogue in pairs and then dwell upon the subject:

A.: Is it true that education in the USSR is free?
B.: Yes, it is. Education in the USSR is absolutely free.
A.: Does this apply[1] to all students?
B.: It certainly does! It applies to all students.
A.: What about dormitory accommodations[2]?
B.: Dormitory accommodations are also free.
A.: And medical care[3]? Is that free too?
B.: Right! Medical care is free too. Didn't you know?
A.: How much does the student pay for using libraries and lab facilities[4]?
B.: Nothing whatsoever[5]! All the costs involved are borne by the state[6].
A.: What about foreign students? Do they receive allowances from the Soviet government?
B.: They do, yes. And this makes it unnecessary for them to work and earn money to meet personal expenses[7].
A.: How do foreign students spend their vacation?
B.: Foreign students enjoy free accommodations at sanatoriums and rest homes.
A.: What about tours of the Soviet Union? Can foreign students undertake such tours?
B.: Of course they can! They can enjoy free or discount-rate tours[8] of the country.
A.: Is it true that foreign students in the Soviet Union are offered wide opportunities[9] to take part in student government?
B.: Yes, that's quite true. They are offered such opportunities.
A.: Now, what about classes? Do foreign students attend classes together with Soviet students?
B.: Oh, naturally they do! They attend all classes together with Soviet students.

Notes

1. **to apply** — относиться
2. **What about dormitory accommodations?** — Как с предоставлением общежития?

3. **medical care** — медицинское обслуживание
4. **lab facilities** — лабораторное оборудование
5. **nothing whatsoever** — абсолютно ничего
6. **costs ... are borne by the state** — расходы берет на себя государство
7. **personal expenses** — личные расходы
8. **discount-rate tours** — поездки по сниженным ценам
9. **opportunity** — возможность

UNIT 2. HIGHER EDUCATION (II)

Grammar: The Present Continuous Tense (§ 27). The Present Perfect Tense (Active and Passive) (§ 32, 33).

TEXT 2A. COOPERATION IN THE FIELD OF HIGHER EDUCATION

Listen to the tape-recorded text and then render it in English:

Education at Soviet higher schools is free. Students do not have to pay for anything — lectures, using lab equipment and libraries, or taking exams. The state foots the bill for everything. And most students get state stipends, distributed by special commissions of administration and student representatives.

Millions of students study at the Soviet Union's universities, institutes and specialized secondary schools.

There were substantial changes in the Soviet higher school system over the last few years. Personnel training for industry and science was accelerated.

New in teaching methods is, first of all, the wide use of technological aids, the "industrialization of education". Recently, educational cinema and TV advanced greatly, and more teaching and control aids are being used.

The Soviet Union has wide international cooperation in higher education. The Soviet higher school's international relations are a large and important part of Party and state foreign policy.

Tens of thousands of specialists, citizens of other countries who have studied at Soviet higher schools are now successfully working in their own countries. Thus, the Soviet higher school contributes to the Leninist principles of peaceful coexistence among states with different social systems.

Exercises

I. *Practice the pronunciation of the following words and word-combinations:*

equipment, stipends, distributed, commission, specialized, accelerated, lectures, representatives, substantial changes, personnel training, industrialization of education, technical aids, teaching and control aids,

foreign policy, successfully, contributes, peaceful coexistence, different social systems

II. *Read the following fluently:*

lab equipment and libraries, the state foots the bill, distributed by special commissions, substantial changes, over the last few years, industry and science, the wide use of technological aids, educational cinema and TV, wide international cooperation

III. *Find in Text 2A English equivalents for the following words and word-combinations:*

высшая школа, бесплатно, лаборатория, оборудование, сдавать экзамен, государство берет на себя расходы, стипендия, представитель, существенные изменения, методы обучения, технические средства учебного процесса, учебное кино и телевидение, международное сотрудничество, внешняя политика, успешно, таким образом, делать вклад, мирное сосуществование

IV. *Form nouns from the following words and translate them into Russian:*

free, to equip, to foot, to distribute, to study, to teach, to accelerate, wide, to aid, to advance, important, different, to contribute, high, to exist, to educate, to change, foreign, to cooperate, to succeed, peaceful

V. *Translate the following words into Russian:*

freedom, equipment, distribution, comparison, construction, durability, existence, difference, translation, picture, moisture, elimination, situation, furniture, reorganization, decision, application, industry, electricity, acceleration, importance

VI. *Read the dialogue in pairs and then discuss it:*

A.: How many students are there at your Institute?
B.: At present there are over 12,000 students at our Institute.
A.: And how many faculties are there?
B.: There are six faculties at the Institute.
A.: How many students study at the Hydrotechnical Faculty?
B.: I think there are about 900 students at that faculty.
A.: How many students are there in your group?
B.: There are 28 students in our group.
A.: How many boys and how many girls are there in your group?
B.: There are 10 girls and 18 boys in our group.
A.: Do they all get stipends?
B.: They do. It's a diligent group.
A.: What do you mean by "diligent"?
B.: By "diligent" I mean hard-working, industrious.

TEXT 2B. HIGHER EDUCATION IN GREAT BRITAIN

Read the text and then write a brief summary of it:

Of the 22 universities in Great Britain, 16 are in England, 4 are in Scotland, 1 is in Wales and 1 is in Northern Ireland. Eighteen universities have engineering faculties.

The leading universities in England are Oxford, Cambridge and London. English universities greatly differ from each other. They differ in date of foundation, history, tradition, general organization, internal government, methods of instruction, ways of student life, size, etc.

British universities are comparatively small. The approximate number is 7,000—8,000 students, most universities having under 3,000, some even less than 1,500 students.

Besides universities, there are several higher technical educational institutions: Regional Colleges[1], 25 in number, 7 National Colleges and Colleges of Advanced Technology[2], which are 10 in the country.

Speaking about education in Great Britain, it should be mentioned that not many children from working class families are able to receive a higher education, as the fees are rather high.

Notes

1. **Regional Colleges** — зональные колледжи
2. **Colleges of Advanced Technology** — технические колледжи повышенного типа

Exercises

I. *Answer the following questions:*

1. How many universities are there in Great Britain? 2. What are the leading universities in England? 3. Are British universities large? 4. Besides universities, are there any other kind of educational institutions in Great Britain? 5. Why is a higher education in Great Britain beyond the reach for most of the children from working class families?

II. *Choose a suitable title for the dialogue; give reasons for your choice:*

A.: Are there any Soviet students at the institutes and universities in the fraternal socialist countries?
B.: Yes, there are. I've read that at present there are hundreds of Soviet students studying at higher schools abroad.
A.: And what about foreigners who want to study at Soviet institutions of higher learning? How can they get admitted?
B.: I know that there are two main channels of admission for foreigners.
A.: What are these channels? Do you happen to know?
B.: I do. The first is through interstate agreements.
A.: And what is the other channel?
B.: It is through Soviet public organizations like the Soviet Women's Committee, the Committee of Youth Organizations, etc.

A.: I see. Are there many foreign students at your Institute?
B.: As far as I know, there are over a hundred.
A.: They don't come from one foreign country, do they?
B.: Oh, no! They come from over a dozen different countries.

Self-Training Work

TEXT 2C

Read the text and then write a summary in English or in Russian. Give the text a suitable title:

The Soviet higher school, which is helping many countries train their national personnel is keenly interested in equivalence. Soviet scientific and technological achievements are known internationally. Our scientists and engineers launched the world's first artificial Earth satellite, built the world's first atomic power station, put the first manned spaceship in orbit, developed lasers and discovered new elements, filling up the blanks in the Mendeleyev Table. Soviet breakthroughs in biology, genetics, chemistry, metallurgy, etc., are universally recognized.

A Soviet diploma means high academic and professional qualifications, the result of a thorough theoretical and professional (general and specialized) training. It also stands for high overall cultural standards. In other words, a Soviet higher school diploma means a blend of theoretical, professional, socio-political, moral and aesthetic education.

While all credit goes to the hard-working student, the diploma is a product of the joint efforts of the teachers who make a skilled specialist out of a "green" freshman; it reflects the achievements of the Soviet higher school which gives young people practically unlimited opportunities to learn a profession.

As Soviet diplomaed specialists are well prepared, they can work both in production and research.

Mutual recognition of diplomas is one of the most serious forms of international cooperation in education. In keeping with its internationalist principles, the Soviet school of higher education will do all it can to reach agreements on comparison and equivalence that will satisfy everyone.

Exercise. *Answer the following questions:*

1. Why is the Soviet higher school keenly interested in equivalence? 2. Are Soviet scientific and technological achievements known internationally? 3. Who has launched the world's first artificial Earth satellite? 4. What other outstanding scientific and technical achievements can you name? 5. What does a Soviet diploma mean? 6. Is the diploma a product of the joint efforts of the teachers and the student? 7. Do you think that mutual recognition of diplomas is one of the most serious forms of international cooperation in education?

UNIT 3. SCIENTIFIC TRAINING IN THE USSR

Grammar: Passive Voice (§ 30).

TEXT 3A. HOW SCIENTISTS ARE TRAINED IN THE USSR

Listen to the tape-recorded text and then study it:

Way back in 1925 post-graduate courses were established in the USSR. These courses laid the foundation for the training of scientists. Ever since then such courses have been the main way in which research workers and teachers of higher schools got their training.

Graduates of schools of higher learning can take a post-graduate course only after doing practical work for at least two years. A post-graduate course can be taken after passing entrance examinations in special subjects, Marxist-Leninist philosophy and a foreign language.

Those who want to do scientific research but have no desire to leave their jobs can do so by taking an extra-mural course of post-graduate training.

It goes without saying that a post-graduate course is absolutely free of charge. Allowances are given and hostel accommodation is provided to full-time post-graduate students. All the necessary scientific instruments are provided free of charge. In other words, everything is being done to enable the post-graduates to carry on scientific research.

While training future scientists have at their disposal well-equipped laboratories and scientific advisers. After finishing their work they present a thesis for a scientific degree.

Soviet young people are provided by the state with everything they need to follow a scientific career and make significant contributions to the development of Soviet science. Scientific workers in our country do not know what unemployment means and have interesting jobs.

Exercises

I. *Find in the text the English equivalents for the following Russian words and word-combinations:*

научные работники, научное исследование, преподаватели высшей школы, очная аспирантура, заочная аспирантура, стипендия (пособие), заниматься научной работой, представлять диссертацию на защиту, вносить важный вклад

II. *a) Express the main idea of the whole text in Russian; b) Define the different clauses in the sentences of the text; c) Make up a plan of the text.*

III. *State to what part of speech the following words belong according to their suffixes:*

education, different, specialist, lecture, language, physics, physical, equipped, library, necessary, higher, foreigner, trainer, difference, free-

dom, educational, historian, mathematician, descriptive, reader, academic

IV. *Read the following sentences and point out the subject and the object in each of them:*

1. At the Building Engineering Institute students have lectures and practical hours. 2. On completion of studies the student presents a graduation thesis or takes the finals. 3. Among the student body of any institution of higher learning one can see quite a number of foreign students. 4. Our country requires more and more specialists with a higher education.

V. *Read the following sentences and point out the predicate in each of them:*

1. Education is free of charge. 2. There is a reading hall and a library where the students can take the necessary textbooks as well as books for reading. 3. Our engineers work on construction sites, at designing institutes, at plants, at hydropower stations, etc. 4. Our Institute houses large classrooms and lecture halls, well-equipped laboratories, a large library and a reading hall, a fine gym, the rectorate, deans' offices and others. 5. Those students who pass all their exams successfully get stipends.

VI. *In the following sentences "one" and "it" are in subject position. Translate the sentences into Russian:*

1. When working with these building materials one can invent new ways of using them. 2. One can apply all these new building methods while constructing high-rise residential houses. 3. One can always find a way out of a difficult situation. 4. One cannot do many things at a time. 5. It will be very important to buy the most necessary equipment. 6. It is absolutely necessary to organize the students' summer practice. 7. One should work well.

TEXT 3B

Study the text and then give it a title. Render the text in English (or Russian):

The use of computer technology in various areas of science and production has prompted the introduction at many universities of the subject of "applied mathematics". Applied mathematics and cybernetics departments have been set up at many higher schools.

Other new trends in the training of specialists are seen in the introduction of courses in psychology, economics and a number of natural science subjects.

Scientific organization of education means rational planning of the study process. It goes without saying that the study process is most effectively planned with the use of computers.

Exercise. *Answer the following questions:*

1. What has the use of computer technology in various areas of science and production prompted? 2. Have applied mathematics and cybernetics departments been set up at many higher schools? 3. What other new trends are there in the training of specialists? 4. Does scientific organization of education mean rational planning of the study process? 5. Are computers used in planning this process?

TEXT 3C. QUALITY EDUCATION FOR ALL

Listen carefully to the recorded text, paying special attention to the pronunciation of the new words:

There are special courses, practicals and seminars for foreign students, and their thesis subjects are chosen with an eye to conditions in their country, to the work they will be doing in the future. Thus, architecture and civil engineering students' courses deal with building in warm and humid climates, there is an accent on tropical medicine in the medical courses, and agronomists take courses on tropical and subtropical farming techniques. Like Soviet students, foreign students take field courses and do practicals before graduation at the finest Soviet factories, at major construction projects, collective and state farms, in hospitals, on geological expeditions.

During the field training experienced instructors — top-skilled industrial workers, builders (civil engineers), doctors, scientists, teachers — help foreign students master professional skills and understand industrial management.

Exercise. *Answer these questions:*

1. What do architecture and civil engineering students' courses deal with? 2. Do foreign students take field courses and do practicals before graduation? 3. Where do they do that? 4. Who helps foreign students master professional skills?

3D. DIALOGUE

Read the dialogue in pairs and then discuss it, using the words given in bold type:

A.: Do you take part in the **activities** of the students' **scientific** society?
B.: Of course, I do! I am **engaged** in **bases** and **foundations.**
A.: By whom is your work **supervised?**
B.: My work is supervised by Professor Sokolov.
A.: Are you going to make a report about your **research work** at the students' scientific conference?
B.: I certainly am! I'm going to do that **with pleasure.**
A.: **Frankly** speaking, **I'm looking forward** to that conference.
B.: So am I. There'll be a number of interesting reports read.
A.: You also go in for sports, don't you?

B.: I can't live a day without sports!
A.: What sports **facilities** are there at your Institute?
B.: We've got several **sport grounds,** volley-ball and **basket-ball courts,** football fields and **a couple of** tennis courts.
A.: I **envy** you, truly I do!
B.: Do you?

Exercises

I. *Give Russian equivalents for all the words and word-combinations given in bold type using a dictionary if necessary.*

II. *Translate into English:*

1. Наш комсорг (komsomol organiser) находится в институте. Я его видел пять минут назад. 2. Когда твой брат закончит институт? — Он закончит институт через два года. 3. Ты был в Ленинграде? — Да, был. 4. Намерен ли ты поехать туда снова в ближайшем будущем (in the near future)? — Да, я буду принимать участие в студенческой конференции. Откровенно говоря, я с нетерпением жду этой конференции и поеду туда с удовольствием. 5. Чем ты сейчас занимаешься? — Я готовлюсь к экзамену по математике. 6. Кто руководитель твоей научной работы? — Руководителем моей работы является профессор Николаев. А в прошлом году моей работой руководил преподаватель Иваненко. 7. Где будет проходить научная конференция? — Конференция будет проходить в главном корпусе (in the main building) института. 8. Когда начинается конференция? — Она начинается в 10 часов утра. Приходи пораньше, я тебя буду ждать. Я должен тебе показать одну интересную статью (article).

UNIT 4. THE PROFESSION OF A BUILDER

Grammar: The Present, Past and Future Indefinite Tenses (§ 26). The Present Continuous Tense (§ 27). The Present Perfect Tense (§ 32). Non-Finite Forms of the Verb (§ 40). *Review:* The Plural of Nouns (§ 9). Modal Verbs (§ 28). Prepositions (§ 16). Word-Building (§ 50—55). The Verb "to be" (§ 22). Passive Voice (§ 30).

Exercises

I. *Repeat after the tape-recorder the following two syllable words stressing the first syllable:*

builder, early, after, grown-ups; area, colleague, building, thirty; to carry, hundred, panel, Moscow; method, welder, noble, civil; knowledge; beauty, master, memory

II. *Repeat after the tape-recorder the following two syllable words stressing the second syllable:*

ago, defence, fifteen; mechanical, to award, design; to assemble, to produce, to become; prefab, existing, machine; to develop, to begin, research

III. *Repeat after the tape-recorder the following polysyllable words:*

patriotic, engineer, resident, numerous, development, quantity; nowadays, traditional, prefabricated, constantly, ferroconcrete, backbreaking; interest, successful, fulfilment, practicable, complicated, institute; realization, industrialized, technical, specification, bricklayer, to introduce

IV. *Translate at sight:*

1. I undertook an interesting job; he undertook building a garage; she undertook research work. 2. He was awarded the USSR State Prize. 3. For her outstanding work she was awarded the Order of Lenin. 4. He was awarded the title of Hero of the Soviet Union. 5. Her brother became a USSR State Prize winner. 6. Prefabricated units are delivered to the construction site. 7. I mastered the crane last year. 8. He mastered the work of a bricklayer. 9. My friend mastered the work of a superintendent (прораб).

V. *In the following sentences put the indirect object before the direct object.*

Model: I sent some interesting books to her.→ I sent her some interesting books.

1. Paul told the whole story to us. 2. Don't give any matches to a small child. 3. Victor wrote a letter to his friend four days ago. 4. I took the new magazine to him. 5. He brought some very nice picture post-cards to his son. 6. I sent a valuable (ценный) dictionary to her. 7. They sent a message to him the day before yesterday. 8. She bought a present for her mother last Saturday. 9. The professor gave a consultation to us last Thursday. 10. We want to send this technical journal to Mary.

VI. *Give sentences of your own using the following verbs in the Past Indefinite:*

to take, to understand, to assemble, to know, to study, to come, to become, to use, to master, to enter, to translate

VII. *Explain the usage of the tenses in the sentences given below:*

1. I am working now. 2. I was working when you passed by. 3. I shall be working when you come. 4. I have been working since 8 o'clock in the morning. 5. I had been working for two hours when you passed by. 6. I shall have been working for five hours when you come. 7. He wrote me that he would soon defend his diploma project. 8. They let us know that they would help us build the new club. 9. I found out that my friend would come on time. 10. The superintendent knew that the young worker would soon learn to operate the gantry crane.

VIII. *Write five sentences illustrating the usage of the Future in the Past, using the verbs* **to say, to tell, to inform, to think** *and* **to know.**

IX. *Give other words of the same suffix and state what part of speech they are:*

builder, early, patriotic, construction, successful, practicable, quantity, mastered, development, building, yourself, prefabricated

REVIEW 1. *Change to plural form. Make all the necessary changes:*

1. This journal is quite new. 2. That young man over there is my close friend. 3. This drawing is well done. 4. This exercise is not difficult at all. 5. That chair over there is broken. 6. This letter is for your friend. 7. This translation is very good. 8. This match is damp. 9. That watch is seven minutes fast.

REVIEW 2. *Choose the correct form:*

1. He (*have, has*) many friends in our group. 2. I (*come, comes*) to the Institute by bus. 3. There (*is, are*) seven days in a week. 4. This is (*a, an*) difficult exercise. 5. There (*is, are*) nobody there. 6. (*That, those*) magazines belong to me. 7. Mr Smith (*teach, teaches*) English. 8. I spend (*a, an*) hour on my homework every day. 9. You and George (*is, are*) good friends. 10. He (*play, plays*) the piano very well.

REVIEW 3. *Translate the following into English using the dictionary:*

в строительстве, в кирпичной кладке, в северных районах, в школе, в институте, в лаборатории, в университете, в этом году, в этом месяце, на этой неделе, на стройплощадке, на факультете, на занятиях, на собрании

TEXT 4A. AN HONOURABLE PROFESSION (I)

Repeat the tape-recorded text after the speaker:

In our country housing construction is being carried out on a large scale. Hundreds of factories producing prefab panels are being constantly built. The successful fulfilment of housing plans in our country is a practicable realization of the industrialized building methods and the development of a large quantity of prefab ferroconcrete panels and parts. The work of a builder is no longer backbreaking and complicated.

Builders, as we know, assemble a house from prefabricated units which are delivered to the construction site. A welder then welds the units to hold them in place. A great variety of materials are nowadays used by builders. Students of building institutes study the existing materials. When they become full-fledged builders they develop new building materials and building methods.

A qualified building worker must now be able to read a technical drawing, he must know the scale and the specifications. If you want to contribute to the beauty of a town or city, if you want to leave a memory

of yourself in the history of that town or city, come to a construction site and learn the trade of a builder. And be sure to enter a Civil Engineering Institute.

Exercises

I. *Find in the text the English equivalents for the following sentences:*

1. Дома строят из сборных элементов. 2. Работа строителя уже не является изнурительной. 3. В строительстве используется большое разнообразие строительных материалов. 4. Он освоил работу крановщика.

II. *Point out the predicate in each sentence of the text.*

III. *Define the tense of all the verbs in the following sentences and then translate them into Russian:*

1. In our country housing construction is being carried out on a large scale. 2. Hundreds of factories producing prefab panels are being constantly built. 3. A great variety of materials are nowadays used by builders. 4. I have been in construction for many years. 5. A qualified building worker must know the scale and the specifications.

IV. *Answer the following questions:*

1. What do you know about Zelenograd? 2. What can you say about the level of housing construction in our country? 3. What is the Russian for "ferroconcrete panels"? 4. What do you think a qualified building worker must be able to do?

V. *In the blanks below insert the proper preposition:*

1. The building profession attracts many numbers ... young men and women. 2. Builders construct residential and industrial buildings, palaces ... culture, etc. 3. Hundreds ... dams, reservoirs, pumpstations have been erected ... our hydrotechnicians. 4. The tremendous (огромный) scope ... construction ... the Soviet Union is proof ... our desire and plans ... peace.

VI. *Open the brackets and use the proper tense:*

1. The building profession (*to attract*) many numbers of young people. 2. It (*to be*) an honourable profession. 3. The person (*to enter*) this profession must (*to have*) a scientific attitude, imagination, initiative and good judgement. 4. A sanitary engineer (*to protect*) the quality of water by treating and purifying this water when it (*to be*) used for domestic purposes. 5. An architect (*to be*) a person who (*to design*) buildings.

REVIEW 1. *Change the following from the Past Indefinite to the Present Indefinite Tense:*

1. My friends often came to see me. 2. She bought all her textbooks at that shop. 3. They usually spoke English with me. 4. Victor and

Valerie were good students. 5. She always asked us many questions. 6. My sister wanted to learn English. 7. It was a very easy translation. 8. I was very busy.

REVIEW 2. *Change into the interrogative:*

1. Mary can speak English well. 2. Arthur can meet us there at three sharp. 3. We should tell Peter about the result of the football match. 4. The boys must explain everything to them. 5. The children may wait there. 6. Vera can translate the whole text without difficulty. 7. Victor can go with us tonight. 8. Irene can swim very fast. 9. You must write him a letter.

REVIEW 3. *Complete the following sentences:*

1. You must not ... 2. Andrew can't ... 3. They may not ... 4. You shouldn't ... 5. I mustn't ... 6. Your friends must not ... 7. The children can't ... 8. We may not ... 9. They shouldn't ... 10. I can't ...

REVIEW 4. *Change into the negative:*

1. She can speak English fluently. 2. You should tell him about it now. 3. The boys must do that again. 4. He may smoke in this room. 5. I can see him tomorrow morning. 6. They should be back before eleven.

REVIEW 5. *Give short answers:*

1. Is your father a civil engineer? 2. Does your friend live in Leningrad? 3. Did all your friends enter higher technical schools? 4. Do you live far from the Institute? 5. Were you at home yesterday at 8 o'clock in the evening? 6. Have you a building speciality? 7. Has your mother any sisters and brothers? 8. Are you interested in classical music? 9. Can you play chess? 10. May I ask you several more questions? 11. Must you be at the Institute at 8.20? 12. Will you study hard while at the Institute? 13. Have you ever worked at a construction site?

TEXT 4B. AN HONOURABLE PROFESSION (II)

Read the text carefully and then make up as many questions as you can. Work in pairs. All the questions should be answered.

The building profession attracts many numbers of young men and women nowadays. It is an honourable[1] profession.

Builders construct and reconstruct residential and industrial buildings, bridges, schools, palaces of culture, museums, theatres, kindergartens and hospitals. They build tunnels, canals[2], power stations, dams and reservoirs. They also construct aqueducts to store and transport water for populated areas and to irrigate desert lands. The distribution of water in irrigated areas is based on annual plans. Very many irrigation systems have been built and are being built and modernized. Hundreds

of dams, reservoirs, locks, pumping stations have been erected on the rivers of our country by our hydrotechnicians.

The person entering this honourable profession must have a scientific attitude[3], imagination, initiative and good judgement, obtained by experience and serious work.

Civil engineers and architects have a common aim — to provide people with all modern conveniences, such as running water, gas, electricity, central heating. While a sanitary engineer protects the quality of water by treating[4] and purifying[5] this water when it is used for domestic[6] purposes, an architect is a person who designs buildings. An architect must receive a great deal of scientific training connected with his profession. He must know mathematics, as well as many facts concerning materials — for example what loads different materials may safely carry — so that there will be no danger of his building falling down. Architects must need some knowledge of sculpture, painting, design, mechanical engineering, geography, city planning, etc. The structure an architect creates should give us pleasure, a sense of beauty. The tremendous scope of construction in the Soviet Union is proof of our desire and plans for peace.

Notes

1. **honourable** — благородный
2. **canal** [kə'næl] — канал (искусственный); **channel** ['tʃænl] — пролив, русло, проток: The Belomor **Canal**, constructed in 1933, joined Leningrad and the White Sea. The English **Channel** separates the United Kingdom from the mainland on the south.
3. **attitude** — отношение, позиция: I don't like his **attitude** towards his work.
4. **to treat** — обрабатывать: In order to make this water drinkable it has **to be treated** with special chemicals.
5. **to purify** — очищать(ся): The water used for reinforced concrete must **be purified** of organic matter.
6. **domestic** — домашний, внутренний: Nowadays gas cookers are widely used for **domestic** purposes.

Exercises

I. *Express the following in one word, using the suffix* **-er/-or**

Model: One who reads→**reader**; One who builds→**builder**

1. One who creates — ... 2. One whose occupation is to produce — ... 3. One whose occupation is to construct — ... 4. One whose occupation is to decorate — ... 5. One who is visiting — ... 6. One who designs — ... 7. One who lives in Leningrad — ... 8. One who lives in a village — ... 9. One who lives in New York — ... 10. One who lives in London — ...

II. *Find in the text the English equivalents for the following words, word combinations and sentences:*

привлекать; в настоящее время; почетный; возводить; для гражданских целей; Профессия строителя — благородная профессия. Они строят и восстанавливают жилые и общественные здания, мосты, школы, дворцы культуры, музеи, театры, детские сады и больницы. У строителей и архитекторов — одна общая цель: обеспечить людей всеми современными удобствами — водой, газом, электричеством, центральным отоплением. Инженер-сантехник следит за качеством воды, в то время как архитектор проектирует здания. Архитектору надлежит знать скульптуру, живопись, проектирование, градостроительство, географию и др. Огромный размах строительства в СССР является доказательством наших планов на мирное будущее.

III. *Render the following in English:*

1. В годы войны было разрушено много архитектурных ансамблей под Ленинградом. Ленинградцы восстановили все архитектурные памятники. 2. Недавно проводилась грандиозная работа по реконструкции Красной площади. 3. Там работали проектировщики, археологи, каменщики и плотники (carpenters), слесари (fitters), жестянщики (tinsmiths) и кузнецы (blacksmiths). 4. Эта работа основана на археологических наблюдениях и архитектурных исследованиях.

IV. *State to what parts of speech the following words belong and translate them:*

breakwater, lighthouse, specialize, specialization, industrial, scientific, initiative, common, provide, central, heating, sanitary, design, safely, carry, mechanical, pleasure, friendship, everyday

V. *Change the following from active into passive:*

1. The building profession attracts many numbers of young men and women nowadays. 2. Civil engineers construct and reconstruct residential and industrial buildings, schools, etc. 3. They built and modernized very many irrigation systems. 4. A sanitary engineer protects the quality of water used for domestic purposes. 5. This architect has received a great deal of scientific training connected with his profession. 6. We build peace, friendship, cooperation and detente through our everyday work.

VI. *Answer the following questions in written form:*

1. Why does the building profession attract so many numbers of young men and women nowadays? 2. Do you know what civil engineers construct and reconstruct at present? 3. For what purposes are aqueducts constructed? 4. The distribution of water in irrigated areas is based on annual plans, isn't it? 5. Are very many irrigation systems being built and modernized? 6. What qualities must a person entering the building profession possess? 7. Civil engineers and architects have a common aim, right? 8. Who protects the quality of the water we use for domestic purposes? 9. What kind of training must an architect re-

ceive? 10. Is the tremendous scope of construction in the Soviet Union proof of our desire and plans for peace?

VII. *Give the Russian equivalents for the following, using the dictionary:*

quality, qualify, qualified, qualitative, qualification, quantity, trade, trade school, trade union, trade(s) committee

VIII. *Make up sentences of your own. Follow the model.*

Model: Civil engineers **specialize in the building of industrial or dwelling construction.**

An architect specializes in designing ... . A hydrotechnician specializes in ... . A road engineer specializes in ... . A sanitary engineer specializes in protecting ... .

IX. *Define the tense of the verbs in the following sentences and then translate the sentences into Russian:*

1. Builders construct tunnels, industrial and residential structures, schools, palaces of culture, etc. 2. Very many irrigation systems have been built and are being built and modernized. 3. Hundreds of dams have been erected. 4. An architect has to think not only of what he wants the building to look like when it is finished, but also what it is to be used for.

REVIEW 6. *Give the plural form of the following words:*

design, town, city, factory, architect, structure, load, house, wife, face, half, watch, bus, child, man, woman, foot, tooth, family, country, shelf, knife, roof, bridge, village, box, price, datum, radio, supply, quantity, dictionary, body, sportsman

TEXT 4C. THE ENGINEER AND CONSTRUCTION

Listen to the tape-recorded text and then retell it in Russian:

The efforts of an engineer, who designs a project, and the constructor, who builds the project, are directed toward the same goal, namely, the creation of something which will serve the purpose for which it is built. Construction is the ultimate objective of a design. The application of engineering fundamentals and analyses to construction activities may reveal methods of improving the quality, while at the same time reducing the costs of construction.

An engineer is engaged to prepare the plans and specifications and usually to supervise the construction of the project. It is the duty of the engineer to design the project which will most nearly satisfy the needs of the occupant at the lowest practical cost.

The engineer should study every major item to determine if it is possible to reduce the cost of the project. It may be possible to change a design, modify the requirements for construction, or revise portions of the specifications in such a manner that the cost of the project will

be reduced without sacrificing its essential value. An engineer who practices this philosophy is rendering a real service to his client. Thus, it seems evident that an engineer should be reasonably familiar with construction methods and costs if he is to design a project that is to be constructed at the lowest practical cost.

Exercise. *Answer the following questions:*

1. Are the efforts of an engineer and the constructor directed toward the same goal? 2. Construction is not the ultimate objective of a design, is it? 3. What is an engineer engaged to do? 4. Is it the duty of the engineer to design the project which will most nearly satisfy the needs of the occupant? 5. Why should the engineer study every major item? 6. Should an engineer be reasonably familiar with construction methods and costs?

TEXT 4D. THE ENGINEER AND CONSTRUCTION ECONOMY

Translate the text in written form using the dictionary:

The cost of a project is influenced by the requirements of the design and the specifications. Prior to completing the final design the engineer should give careful consideration to the methods and equipment which may be used to construct the project. Requirements which increase the cost without producing commensurate benefits should be eliminated. The ultimate decisions of the engineer should be based on a reasonable knowledge of construction methods and costs.

The following are indicative of methods which an engineer may use to reduce the costs of construction:

1. Design concrete structures with as many duplicate members as practical in order to permit the reuse of forms without rebuilding.
2. Simplify the design of the structure where possible.
3. Design for the use of cost-saving equipment and methods.
4. Eliminate unnecessary special construction requirements.
5. Design to reduce the required labor to a minimum.
6. Specify a quality of workmanship that is consistent with the quality of the project.
7. Furnish adequate foundation information where possible.
8. Refrain from requiring the contractor to assume the responsibility for information that should be furnished by the engineer or for adequacy of design.
9. Use local materials when they are satisfactory.
10. Use standardized specifications, with which the contractors are familiar, where possible.

UNIT 5. SPORTS

Grammar: Conditional Sentences (§ 39). The Gerund (§ 47).

TEXT 5A. SPORTS FACILITIES IN MOSCOW

Listen to the tape-recorded text and repeat it after the speaker:

Before the decision was taken to hold the 1980 Olympics in Moscow, the city already had all the sports facilities needed for such an event. Moscow had been the venue of the USSR Games finals which compare in scale to the Olympics, of the University Games, of many world and European championships and other international contests. Among its sports facilities, many of which were used for the Olympics, are 69 stadiums, over 1,300 gymnasiums, 29 swimming pools, two cycling tracks and a rowing canal.

All that had been built in Moscow for the 1980 Olympics is of use after the Games, and would have been built even without the Olympics — under Moscow's master plan. This event had on no account reduced the planned housing programme.

The Olympic Village of eighteen 16-storeyed blocks of flats comprised a new 107-hectare residential district with a 10,000-bed hotel complex in Izmailovo district of Moscow, a 1,500-channel automatic international telephone exchange, an automated Games administration and information system, a canopied stadium and an equestrian sports complex. Muscovites have undoubtedly found all these facilities a most welcome addition, irrespective of the Olympic Games.

Exercises

I. *Keep in mind the suffixes of nouns:* **-sion, -tion, -ty.** *Find the words with the above given suffixes in the text and translate them into Russian.*

II. *Give the opposite meaning of the following adjectives:*

irrespective, unplanned, impossible, indirect, indifferent, irregular, unknown, dishonest, illegal, uncomfortable, unimportant, jobless, homeless, useless, unlike

III. *Form verbs from the following nouns according to the model:*

Model: decision→**to decide**

addition, administration, production, observation, dictation, composition, operation, reduction, comparison, information

IV. *Translate the conditional sentences:*

1. I shall read this copy of the *Daily World* if I have time. 2. He should translate this article from the *Morning Star* if he had time. 3. If it were warm in the room, she would open the window. 4. If I were you, I should pass all my examinations in due time. 5. They would go to the

park if they were not so busy. 6. Would you go to Leningrad if you had your vacation now? 7. Had he been unwell yesterday, he would not have attended classes. 8. Had they had time last week, the article would have been translated by them.

V. *Insert the proper preposition in the blanks of the sentences:*

1. The whole team came back ... twenty-five minutes. 2. Will the game be over ... a quarter of an hour? 3. I have known that athlete ... many years. 4. The match will begin ... six sharp. 5. Yesterday's swimming contest lasted ... three hours. 6. I see these young athletes ... time ... time. 7. Once ... a while she goes ... the stadium ... bus. 8. Peter's training hours are ... seven ... nine. 9. The basketball team didn't arrive until late ... the afternoon. 10. Are you sure that no one called me ... my absence? 11. We haven't played volley-ball ... that team last summer. 12. I'm afraid they won't be back ... four o'clock. 13. She'll be back ... about an hour or two. 14. ... what time do they usually start training?

VI. *Change the following from active into passive. Keep the same tense with each change:*

1. He bought these skates a year ago. 2. She has just finished her report on track-and-field athletics. 3. Somebody has just taken one of the oars. 4. The doctor strongly advised me to go in for rowing. 5. One of our young athletes broke the skating record a week ago. 6. We heard the enthusiastic cheers of the fans. 7. Thousands of people lined the street leading to the stadium. 8. Everybody will soon see the documentary film about the achievements of our top gymnasts. 9. We cannot hold our competition in this small hall. 10. Victor won the first prize last autumn. 11 They are sending their coach to Minsk on a special mission.

TEXT 5B

Translate the text in written form and then give it a title:

The game of basket-ball is unique among popular sports. It was invented by a Canadian, was first played in the United States, and was planned deliberately to meet a definite need.

In 1891, Dr. James A. Naismith was a physical director of the International YMCA (Young Men's Christian Association) Training School in Springfield, Massachusetts. For some years the interest of young Canadians and Americans in the customary program of calisthenics and gymnastics had been lagging.

Dr. Naismith was asked to design a competitive game that would hold the enthusiasm of the students. It was agreed that the game should have simple rules that could be learned easily. It should be free from bodily contact; adaptable to play by day or night in small gymnasiums; beneficial to players over a wide range of ages and it should not require expensive equipment. Dr. Naismith solved all these problems in his game. He called it basketball because its original purpose was to toss a round ball into a half bushel peach basket hung at either end of the gymnasium. At first the game was played with as many as nine players

on a side, but it was soon realized that five to a team resulted in cleaner and faster play.

The inventor proposed 13 basic rules, and most of them are still in effect, but there have been some changes in playing conditions and the tools of the game.

The first basketball game was played in Springfield in January 1892. Basketball as a men's game had become so well accepted internationally that it was included in the Olympic Games program in Berlin in 1936.

Exercises

I. *Point out all the compound and complex sentences in the text.*

II. *Discuss the connective words in class.*

TEXT 5C. A MODERN SCHOOL OF GYMNASTICS

Give a written translation of the text:

In our town the building of the gymnastics school reminds[1] one of an aircraft hanger[2], but inside it is cosy[3] and warm. It has three sections — the first, a dressing room[4] with showers, a clinic and a coaches'[5] room; the second, magnificent[6] tennis courts, and the third — a big hall with gymnastics apparatuses.

The big gym has three horizontal bars[7], four vaulting-horses[8], three sets of parallel bars[9], a 20 m^2 acrobatics floor, a trampoline[10] and a paralon platform beside it. From the ceiling hang three sets of rings[11]. There are also special spheres and platforms on which young athletes do their warm-up exercises[12].

Before a youngster is accepted to the educational and training group he or she does two years of preliminary[13] training.

This school is just like any general educational school — there are no fees whatsoever[14].

Notes

1. **to remind** — напоминать
2. **aircraft hanger** — ангар для самолетов
3. **cosy** — уютный
4. **dressing room** — гардеробная
5. **coach** — тренер
6. **magnificent** — великолепный
7. **horizontal bar** — перекладина, турник
8. **vaulting-horse** — конь
9. **parallel bars** — параллельные брусья
10. **trampoline** — трамплин
11. **three sets of rings** — три комплекта колец
12. **warm-up exercises** — разминка
13. **preliminary** — предварительный
14. **there are no fees whatsoever** — совершенно бесплатно

Exercise. *Fill in the blanks with the correct reflexive pronoun:*

Model: We enjoyed ... very much at the stadium yesterday.→ We enjoyed **ourselves** very much at the stadium yesterday.

1. I hurt ... badly when I fell down from the parallel bars. 2. She enjoyed ... at the circus on Saturday. 3. Does Bill shave ... every morning? 4. Max and Dave enjoyed ... very much last Sunday. 5. Mary once cut ... badly while pealing potatoes. 6. Little Nancy is not old enough to dress ... . 7. Bob's dog hurt ... while chasing a cat. 8. My son prefers to do his homework by ... . 9. I'm sure I can easily finish this work by ... . 10. He went for a walk in the woods by ... .

5D. DIALOGUE

Study the dialogue and read it in pairs. Give the dialogue a suitable title:

A.: Is it true that football is the most popular sport in Britain?
B.: I've never been to Britain, but that's what they say.
A.: I've heard that there are two kinds of football and that they are both played in Great Britain. Is that so?
B.: Oh, yes! They play soccer and rugger.
A.: What is "soccer"? How is it played?
B.: "Soccer" is what we in this country call simply "football".
A.: Really? And then what is "rugger" and how is it played?
B.: "Rugger" is Rugby football. They play it with an oval ball.
A.: As far as I know, rugger is becoming popular here too.
B.: Rugby football, by the way, is very popular in New Zealand and in France.
A.: I've been told that most English boys appear to be born with the ability to play football.
B.: Yes, they play it at school, they play it in public parks. In other words, they play it wherever they can.
A.: And whenever they can. I'm sure it's the same in most countries of the world.
B.: Some of them become professional players when they grow up.
A.: So you say there is professional football in Britain?
B.: Definitely, there is! And it provides entertainment for all the football fans. Great entertainment, I should say!
A.: I'm sure football is a business in Britain, too. Am I not right?
B.: You are absolutely right! Football is also a business in Britain.
A.: There's something else I'd like to ask you. May I?
B.: Sure, go ahead! What is it?
A.: Where does the game called "Rugby football" or "rugger" take its name from?
B.: It takes its name from the school where it was first played.
A.: When was that? Long ago?
B.: That was way back in 1823, over a hundred and fifty years ago!

A.: Would you say that tennis is as popular as football?
B.: No, I wouldn't. But tennis is becoming enormously popular.

Exercise. *Copy out all the complex sentences from the dialogue and discuss the connective words in class.*

TEXT 5E. HOW TO KEEP FIT

Repeat the tape-recorded text after the speaker:

Nowadays almost all people, both young and old, are fond of some sport, not only because they understand that one must take exercises to keep fit but also because it's great fun.

In autumn, when the days get shorter and colder both children and grown-ups begin to watch for the first snowflakes. When the snow covers the ground, they go skiing. Ice skating is another popular winter sport. There are numerous skating-rinks all over the country.

Hunting and fishing are also winter sports. When the snow is very deep hunters use skis. Anglers go to rivers, lakes or ponds, make a hole in the ice and sit beside it for hours waiting for the fish to bite.

The most popular summer sports are swimming, rowing, fishing, track-and-field sports, cycling, mountain climbing, hiking and games. You can play volley-ball, basketball and tennis all the year round.

Football is one of the most popular summer sports. Most people are fond of football. If they don't play themselves, they are football fans.

Sports are very much the same in most countries, but some sports are more popular than others in a certain country. Baseball is a most popular game in the United States of America, cricket is popular in England and in Australia.

Football, called soccer in England, is played by teams of eleven with a round ball. American football, called just football in the United States, is played by teams of fifteen with an oval ball. In both countries there are professionals and amateurs in sports.

Exercises

I. *Answer the following questions:*

1. Why are almost all people nowadays fond of some sport? 2. When do people go skiing and ice skating? 3. Are hunting and fishing also winter sports? 4. What are the most popular summer sports? 5. Which is your favourite game? 6. Are Olympic Games an important event in the cultural and sport life of the world?

II. *Translate the following paying attention to the translation of the verb* **to be:**

is known all over the country; is deep; is a sportsman; is a football fan; is free; is cold; is short; is of interest; is playing tennis; was difficult; was at the beginning; was a great athletic festival; was forbidden to compete; was awarded; was held; are known all over ...; are deep; are sportsmen; are football fans; are free; are cold; are short; are of in-

terest; are playing tennis; were difficult; were at the beginning; were great athletic ...; were forbidden to compete; were awarded; were held

III. *Complete the following sentences by adding the necessary auxiliary verb:*

Model: I'm not a good runner, but my brother ... → I'm not a good runner, but my brother **is.**

1. I don't live near the stadium, but my friends ... 2. I'm not good at playing basket-ball, but Olga and Mary ... 3. They haven't taken part in the race, but we ... 4. She doesn't go in for tennis, but I ... 5. His friends are not football fans, but mine ... 6. I like to row very fast, but Peter ... 7. Ann does not play chess well, but Nina ... 8. Jim can't swim very fast, but Alec ... 9. Your team was not tired at all after the game, but mine ... 10. I didn't watch the hockey game on TV last night, but Nick ... 11. Dan isn't a good cyclist, but Dennis ... 12. Frank and George were not at the skating-rink on Saturday afternoon, but Helen and her elder sister ... 13. I'll not go swimming tomorrow, but all my roommates ... 14. Tom has no time to play volley-ball with us this week, but Victor ...

IV. *Give the comparative and superlative degrees of the following adjectives:*

great, long, thin, short, tall, low, beautiful, pleasant, interesting, expensive, good, bad, high, far, near, difficult, easy, hard, important, necessary, dark, light, heavy, fast, slow

V. *Point out the Gerund in the following sentences and translate them into Russian:*

1. They are very fond of playing tennis. 2. Running for a quarter of an hour each morning is very good for one's health. 3. Upon returning from the gym, we all took a shower. 4. On having finished the game, the boys began to dress. 5. I intend going to the Palace of Sports on Friday. 6. The coach insists on starting the game as early as possible. 7. We were all surprised at his having jumped so high. 8. After winning the match, we decided to celebrate the victory. 9. I was surprised at his rowing so beautifully. 10. Swimming against the strong current was very difficult. 11. He kept on running and running until he reached the finish line. 12. They continued playing in the field in spite of the rain.

VI. *Make up as many questions as you can using the words* **what, when, where, how, who** *and* **why.** *All the questions should be connected with sports.*

VII. *Change to question form:*

1. We must do daily exercises to keep fit. 2. They will have to play this game again. 3. Jack can throw the discus farther than anyone else in this group. 4. We should tell our new coach about our previous achievements. 5. He has to explain the rules to both teams. 6. Irene can swim faster than all the other girls. 7. Ann would like us to take an active part in the forthcoming race.

VIII. *Ask and answer:*

1. Which season of the year is most suitable for outdoor swimming? 2. Can you play tennis all the year round? 3. Is football a very popular game in our country? 4. Are you a good basket-ball player? 5. Is your close friend a hockey fan? 6. Do your parents go in for sports? 7. Do you live near a stadium? 8. When is it best to play baseball: in summer or in winter? 9. Will you go to the gym tonight? 10. Are you a long-distance runner?

IX. *Construct as many sentences as possible using the table:*

I	am		practice jumping tomorrow.
Peter			have a talk with my coach.
My friend	is		take part in Saturday's race.
Ann's sister		going to	bring an interesting book on fencing.
We	are		play football next Friday.
They			the stadium on Sunday.
Dan and Tom			watch a hockey game on TV.

X. *Translate the following paying attention to the translation of the verb* **to have:**

1. We had such fine weather during the Olympic Games. 2. She has a lot of friends among the players of the winning team. 3. He has lost his new pair of tennis shoes. 4. They have just finished building a new swimming pool near the stadium. 5. I have to see and speak to my new coach tomorrow at 9. 6. My sister had to meet the referee at the railway station the other day. 7. You'll have to work harder if you want to achieve better results. 8. I have no time to go to the gym this afternoon. 9. Have you ever played baseball?

XI. *Give other words of the same root and state what parts of speech they are:*

to compete, to jump, to dive, to ride, to play, to swim, to fish, to cycle, to climb, to run, to fence, to train, to box, to wrestle, to row, to shoot, to march, to sail

XII. *Illustrate the use of the following in sentences of your own:*

to be fond of smth.; to be great fun; to go skiing; to keep fit; to be a fan; track-and-field sports; mountain climbing; to take part in; to achieve good results in; to win a game; to lose a game; to root for smb.; to end in a tie; to go in for jogging

5F. DIALOGUE

Point out what main themes are dwelt upon in this dialogue:

A.: Do you know that the Olympic Village in Moscow was the best during the whole history of Olympic Games?
B.: No, I don't. I had no idea that it was so good.
A.: And now it is one of the major centres in Moscow for the development of sport.
B.: That's wonderful, isn't it? The sports facilities there are available to Muscovites who live there, right?
A.: Right! Contests of various kinds are being held in the former village.
B.: I've heard that thousands of people attend practice sessions.
A.: That's very true! A great many Muscovites attend physical training groups at the village after working hours.
B.: What about leading Soviet athletes? Do they also practise there?
A.: Of course, they do! They practise at the sporting facilities of the former Olympic Village too.
B.: What is the population of the former Olympic Village? Do you know?
A.: I've been told that about 15 thousand people live there now.
B.: They must be very lucky to live in such comfortable flats.
A.: It goes without saying that they are lucky. Very lucky indeed.
B.: But the fate of the Olympic Village in Lake Placid is quite different from that of the former Moscow Village.
A.: Different, you say? What do you mean?
B.: After the Winter Olympics the Village in Lake Placid was turned into a prison.
A.: A prison? Are you sure? How dreadful!
B.: Feelings of the American public ran high when they learnt about that.
A.: I can imagine how indignant most people in America were when that was announced. What a disgrace!
B.: By doing that they violated the Olympic ideals of peace, justice and humanism.

UNIT 6. HOUSING (I)

Grammar: Passive Voice (§ 30). Complex Sentences (§ 3). Participle Constructions (§ 42). Word-Building (§§ 50—55).

TEXT 6A. THE DEVELOPMENT OF THE HOUSE

Read and translate the text. Repeat the tape-recorded text after the speaker:

The first houses in different countries of the world were made of wood. At that time the greater part of our planet was covered with thick forests[1]. Even in those days men found ways of using wood as a build-

ing material. In some places they tied together the tops of several trees and covered them with the hides (skins) of animals. In other places they covered them with leaves or grass.

The primitive[2] people's first houses were tents or huts. Primitive building required no tools. The invention of tools permitted the cutting of stones and timber. Stone was the most convenient building material[3] in countries where there was not much wood but plenty of stone.

People began to use stone widely to build their houses many centuries ago. With the development of stone cutting finer tools appeared.

The column has played an important part in the history of building. Most of the building of old times was based upon the column and beam method[4] of construction.

About 4,000 years before our era the Egyptians possessed great constructional know-how (ability)[5]. They built simple houses by present standards. They used bricks which in their most primitive form were not burned[6], but were hardened[7] by being dried in the sun. Since the middle ages[8], brickwork has been in constant use everywhere, in every sort of construction and in every architectural style. They made flat roofs because there was very little rain in Egypt. Their buildings were simple in construction but very beautiful. We still admire their monuments, sphinxes and palaces.

Greek builders learned much from Egyptian builders. They built their houses with slanting roofs[9] because the climate of these two countries differs greatly. Soon Greek builders became second to none[10] in column making. But they added the arch, thus adding much strength and beauty to their buildings.

The use of precast[11] concrete, a very advanced construction technique, has many advantages over other building materials. Precast building units can be assembled at the site all the year round in any weather. The precast concrete technique which is constantly being improved in our country, plays a great role in our extensive building program.

Notes

1. **thick forest** — густой лес
2. **primitive** — 1) первобытный; 2) примитивный, простой
3. **convenient building material** — подходящий стройматериал
4. **the column and beam method** — колонно-балочный метод
5. **know-how (ability)** — умение
6. **to burn** — обжигать
7. **to harden** — придавать твердость, прочность
8. **since the middle ages** — начиная со средних веков
9. **slanting roof** — покатая крыша
10. **to be second to none** — не иметь себе равных
11. **precast** — сборный

Exercises

I. *Make up as many questions as you can connected with the text.*

II. *Give a written translation of the following sentences:*

1. Cutting stones and timbers became possible with the invention of tools. 2. The building of skyscrapers was started in the 19th century. 3. By using industrial methods of construction the speed of construction may be considerably increased. 4. The technology of construction provides for transporting precast reinforced concrete elements by rail or by lorry. 5. Erecting tall buildings without using building mechanisms is now unthinkable. 6. Prestressed concrete is widely used in building modern structures. 7. The use of fine tools resulted in developing building methods. 8. Methods of designing structures are changing. 9. Up-to-date building is based upon using industrial methods of work. 10. Due to our introducing mechanical aids labour productivity increased greatly. 11. Timber, stone and brick being the oldest building materials is common knowledge.

III. *Study the dialogue and write down the sentences containing interesting information for you:*

The Early Houses in Great Britain

A.: What did the early houses in Great Britain look like?
B.: Most of them were round and built of wood.
A.: Do you know whether those houses were plastered?
B.: Sure, they were. A plastered house is warmer and looks nicer.
A.: How did the light come into those early houses?
B.: Well, as you know, there were no windows in such houses.
A.: No windows? What do you mean "no windows"?
B.: That's exactly what I mean: those early houses had no windows.
A.: Then how did the light come in? Through the roof?
B.: Yes, through the roof. There was a special hole in the roof for that purpose.
A.: What did they do when it rained? Cover up the hole?
B.: Right! They covered that hole and opened the door.
A.: The Romans built their houses of brick, didn't they?
B.: They did. They built their houses of brick because that was their only available (доступный) building material.
A.: Do you mean to say there was a lack of timber?
B.: Yes, there was a lack of timber in ancient Rome.

Self-Training Work

TEXT 6B. HOW A SMALL BRICK HOUSE IS BUILT

Look up the italicized words in the dictionary. Read the text, study it and then write a précis (конспект, краткое изложение). Find in the text examples to illustrate the effective use of the connectives:

Houses are more than just bricks and *mortar*. Before any bricks are laid a lot of thinking and planning has to be done. The plot of land has to be chosen, and it is then decided what kind of house is to be built. Quite a lot of people all work together to make the house.

A *surveyor* measures the plot of land or site and makes a plan of it. An architect draws pictures of what the house will look like when it is built. He draws plans to show the size of the house, the shape of the rooms and where all the *fittings* must go in the house.

The plan of the house is drawn on to the plan of the *site*, ready for the builder. Copies of the plan are made and are given to the builder. He gives a copy to the men in charge of the different work that will have to be done. The builder then marks out the shape of the house on the site. He does this with wooden *pegs* and *tape*. Everything is now ready for the workmen to start. They *dig away* the *top-soil* and cut trenches about two or three metres deep along the tapes. The workmen mix cement, sand, *pebbles* and water in a cement mixer to make concrete. They use the concrete to fill in the bottoms of the trenches. This is called laying the foundations. The walls of the house will be built on the concrete foundations.

The spaces between the foundations walls are filled with concrete. This is sometimes used as a base for the floor of the building.

The man who builds walls is called a bricklayer. The bricks are stuck together with mortar. To make the walls stronger the bricks must *overlap* each other. This is called *bonding*.

When the walls are just above the ground a layer of waterproof felt or slate is laid. This is called a *damp-proof course* and stops damp in the ground passing to the rest of the house. As the bricklayer works he often looks at the plans. Then he will know where to build in the doors, windows and ventilators.

A carpenter now begins to work. He is the man who does the rough woodwork of the house. When the walls are at the level of the first floor he puts in the wooden floor *joists*. These are strong wooden beams which will carry the *upstairs* floors and hold up the ceilings in the *downstairs* rooms. Then the joiner fixes the *window-ledges* and when the walls are plastered he fixes the doors and other woodwork.

Nearly all the woodwork in a house used to be done by carpenters and joiners on the building site. This took quite a lot of time. Today most of the woodwork is made at a *joinery works*. At the joinery works, machines plane the wood smooth and cut it to the right size. Machines also make the joints ready for the men to fit the pieces together.

Doors, window frames and even the stairs all come to the building site on *lorries*. They are ready to be *fixed* in the houses.

When the walls of the house are too high for the *bricklayer* to reach, the first *scaffold* is made. A scaffold is a platform of planks for the workmen to stand on. This is usually held up by a frame of steel *tubes*. Extra scaffolds are *put up* as the workmen need them. As soon as the men get on to the scaffold all the things they need have to be lifted up to them. Men used to carry bricks and mortar up *ladders*. Now there are many different ways of getting these things up to the scaffolds. Some builders

use *elevators*. These are like moving staircases. A man at the bottom *puts* the materials *on*, and a man on the scaffold platform *takes* them *off*. On tall buildings the builder may use a lift which can be moved to different places. All these things help the workmen to build houses more quickly.

A lot of strong timber which we cannot see is used to make a roof. The highest beam is called the *ridge*. The *sloping* beams are called *rafters*. When the roof is on, many different workmen can come and finish off the house.

Plumbers work on all the water pipes of the house. They lay pipes to carry clean water into the house from the *water main*. Plumbers also lay pipes to carry waste water away to the sewers.

Glaziers put glass in the window frames to keep out the wind and the rain. When all the *wires* and *pipes* are in place the house is ready for the *plasterers*. They are the men who make the ceilings and walls nice and *smooth*. The *joiners* finish all the woodwork in the house, and leave it ready for the *painters* and the decorators.

TEXT 6C. HOUSING IN MOSCOW

Copy out of each paragraph the sentences containing the most important information. Define different clauses in the sentences given below:

Prefabrication plants in Moscow produce thousands of standard panels and structures — including toilet and bathroom units. These large panel buildings can be assembled in a variety of architectural arrangement.

On the southern fringe of the capital, on the way to Vnukovo Airport, one can see miles upon miles of construction work with forests of cranes lifting great panels. The blocks of flats going up there vary from nine to twenty storeys and 95 per cent of the buildings are of prefabricated structures.

Retail shops, launderettes, various repair services and so on are located on the ground floors of the blocks of flats. It is served by modern ten-year schools, kindergartens and polyclinics. Two cinemas to seat 1,000, libraries and sports stadiums as well as clubs are also in the district.

Standing out from the surrounding housing, there are three experimental 22-storey tower blocks at the site. The builders usually assemble a 22-storey block of 147 flats in three months. 12-to-16-storey flats can be put up in just three weeks. New materials and ideas are being tried out and tested in the blocks. For instance, the white exteriors of the tower blocks were relieved at intervals by pleasant blue-coloured panels which appeared to be of some ceramic material.

In cross-section the building forms a cross — its four wings, housing the flats, were so designed that during the course of a day each flat receives some sunlight. The central core of the building houses the fast passenger and freight lifts and auxiliary service rooms with ample space for parking bicycles and prams.

6D. DIALOGUES

Memorize these dialogues:

I. — What do we call that part of a building on which the walls rest?
— We call it the foundation.
— And what do we call the top covering of a building?
— We call it the roof.

II. — What is the purpose of a column?
— A column either supports or decorates part of a building.
— Can a column stand alone as a monument?
— Of course, it can.

III. — Have you ever been to Bratsk?
— No, I haven't. And you?
— I've been there twice.
— How lucky you are!

IV. — What is a house?
— It's a building made for people to live in.
— And what is a building?
— It's a structure. Houses, schools, factories and theatres are all buildings.

V. — What is a beam?
— It's a long, thick, heavy piece of wood or concrete.
— Where are beams used?
— They're used in building.

VI. — What is lime? Do you know?
— It's a white substance obtained by burning limestone.
— Is it used in making cement and mortar?
— Right. It's used in making cement and mortar.

VII. — What sort of a mixture is mortar?
— It's a mixture of lime, sand and water.
— What is it used for?
— It's used to hold bricks, stones, etc. together.

Exercises

I. *Explain the usage of the tenses and the forms of the verbs. Make a written translation of the passages:*

1. The new tenants were shown a three-roomed flat ready for occupation — the painters and decorators having finished their work just recently, judging by the smell of fresh paint that met them as they entered the spacious hall of the flat. Two bedrooms and a living room were situated off the hall and the flat had a fairly good-sized kitchen with an electric three-plate cooker already installed.

2. The regulations now state that no gas can be used in blocks of flats that have more than 12 storeys because of the danger of explosion. The fixed rate for electricity is normally four kopecks a unit but where electricity is used for cooking the fixed charge is only two kopecks a unit.

All the wiring is embedded in the walls. The prefabricated bathroom was tiled with light-coloured plastic tiles from top to bottom.

3. Kindergartens will be situated handy for residential areas and within easy walking distance there will be schools, a large shopping centre and cultural centre and stadiums and a swimming pool. The most interesting feature about this development is that all traffic, garages and bus stops are located underground. The metro is extended to the new development to provide a quick service to the capital's centre.

II. *Render the following in English:*

Новая пятилетка — серьезный экзамен для строителей. Характерная ее черта — концентрация сил на скорейшем завершении и пуске тех предприятий, которые способны обеспечить наибольший прирост продукции. 135 крупнейших новостроек страны взял под свое шефство Ленинский комсомол.

В одиннадцатой пятилетке предполагается пустить очередь водовода от канала Днепр—Донбасс до Харькова, протяженностью в 142 километра; более 6 тысяч га засушливых земель позволят оросить новые мощности Северо-Крымского канала.

III. *Read the text and render it in Russian:*

The main elements of the country's housing policy remain: the provision for more housing in town and country; its equitable distribution, proper maintenance, and low rents. Rents in the Soviet Union amount to no more than an average three per cent of the family incomes of office and factory workers. Rents and rates in this country have remained unchanged for many decades.

At the same time the Soviet Union is also implementing a large housing programme. The current scale of housing construction in the 11th five-year plan period (1981—1985) is being continued, and it has also been decided to improve its quality.

In the 63 years of Soviet power a total of 3,500 million sq m of housing have been built, including 2,000 million sq m of state, public and cooperative housing. In the past five years alone over 50 million people have moved to new flats.

Housing investment is constantly growing and has reached a record post-war level of nearly 20,000 million roubles a year. Town flats are equipped with all modern cons: 89 per cent of them have running water; 87 per cent flash toilets; 86 per cent central heating; and 79 per cent are attached to the gas mains. Everything has been done to solve the major social problem — of how to give every family a flat of their own. At the moment around 80 per cent of town-dwellers live in individual flats.

The new legislation gives special consideration to improving the housing conditions of large families and newlyweds, of World War II invalids and some other categories of citizens, as well as of factory and office workers with a long length of service.

UNIT 7. HOUSING (II)

| **Grammar:** Word-Building (§§ 50—52). The Emphatic **it** (§ 4). |

Self-Training Work

TEXT 7A

Look up all the unknown words in a dictionary. Write them down. Read the text and give it a title. Divide the text into several logical units. Express the main idea of each unit in written form and give it a suitable title:

Houses are built of wood, brick, stone and concrete. Many new types of individual houses are made from reed slabs, rolled gypsum concrete panels or wooden sheets. A lot of houses are built of prefabricated blocks (prefabs). All the parts of such houses are produced on an industrial scale in factories and assembled on the spot. The building process takes place under the supervision of formen and engineers. The structure is put up by bricklayers, carpenters, plasterers, plumbers, painters, locksmiths, glass-cutters, etc. In the construction of a house the first step is to make a careful survey of the site and to examine the soil in order to find its bearing power. Next, the building lines are staked out. After this, the foundations are built. The excavation is dug for the basement and then followed by the actual building of the foundation walls below ground level. Then the foundation work is finished by providing anchoring sills. That is the case of a wooden building. In the case of a brick structure, the building of the walls may be directly proceeded with. Foundations are to keep the floors and walls from contact with the soil, to act against the action of the frost and to prevent from settlement. The part upon which the stability of the structure depends is the framework. It carries the loads which are imposed on it. To do this work properly and safely the floors, walls, roofs and other parts of the construction must be correctly designed and proportioned. The designer determines the size of the walls, the floor joists, the beams, the girders and the parts which make up the framework. He also decides how they are to be spaced and arranged. The building of a wall consists in laying down courses of bricks and bonding them together with mortar. The instrument used by the bricklayer is called a trowel. In order to shape the brick to the necessary size or to chip it, the brick chisel and the hammer are used. Walls are constructed to enclose areas and to support the weight of floors and roofs. The walls may be solid and hollow. Besides brick, stone, concrete and other natural and artificial materials are used for the construction of walls. When doors or windows are to be made, a lintel is usually inserted in the wall above the opening. The entrance leading into the house from the street is called the front door, from the yard — the back door. The sashes are placed in position only later and so, of course, are the window panes. The panes are fastened in with the help of glazier's putty. Storeys are separated by several successive layers: the firestop joists and rough flooring. The regular flooring

is placed upon the rough floor, being supported by stringers and girders. The staircase leads to the upper floors. The staircase consists of stairs (steps). When we ascend or descend from step to step we hold on to the banisters (handrails). The steps between two landings are called a flight of stairs. Floor boards are laid in several different ways. Of these the more usual are: Plain jointed, when the boards are simply laid side by side, a nail is being driven in through the boards into each joist. Tongued and grooved, one board can first be nailed and the other board, upon being slipped into it, will be kept down by the form of the joint. Thus the nails are prevented from appearing on the surface of the floor. Walls may be either covered with wall-paper or only plastered. In both cases, lathwork is first made which is subsequently covered with plaster. The chief instruments used by the plasterer are the trowel and the float. The whole structure is crowned by the roof which covers the building and protects it from exposure to the weather. It ties the walls and gives strength to the structure. A complete roof consists of covering, sheathing, rafters, purlins and roof trusses. The covering is the outer or weather-resisting coating of the roof. The materials mostly used for the covering are shingles, slate, tiles and iron. The sheathing is the layer of boards or other material to which the covering is attached. The rafters are the inclined beams which support the sheathing. The purlins support the rafters. The roof trusses are the frames which support the roof and transmit its weight to the walls or columns of a building. The wall-plates are plates which are laid on top of the wall to distribute the weight transmitted by the trusses. The ridge is the highest horizontal line of the roof. After the building of the house proper is completed there will be need to make a number of connections: sewer and water pipes with faucets (taps). This particular part of the work is undertaken by plumbers, while electrical, gas, and other connections are made by the electricians, etc. Architects have worked out the details of a few types of comfortable and inexpensive individual houses — summer cottages. These houses are so simple that anyone with a knack for building can assemble one of them himself.

Exercises

I. *Answer the following questions:*

1. What is the first step in the construction of a house? 2. Are the building lines staked out after this? 3. Then the foundations are built, aren't they? 4. When does the actual building of the foundation walls begin? 5. Do we provide anchoring sills when the foundation work is finished? 6. That is the case of a wooden building, isn't it? 7. Is the part upon which the stability of the structure depends called the framework? 8. Does it carry the loads which are imposed on it? 9. What do we call the tools used by a bricklayer? 10. Can you name the chief tools used by a plasterer? 11. Are you able to explain the difference between a front door and a back door? 12. Natural and artificial building materials are used for the construction of walls, right? 13. Will there be a

need to make a number of connections after the building of the house proper is completed?

II. *Complete these sentences:*

1. In order to build a house a careful ... of the site has to be made and the soil has to be examined in order to... 2. When the building lines are staked out, the... 3. The foundation work is finished by providing... 4. Foundations keep the floors and walls from... 5. The stability of a structure depends on... 6. The designer decides how ... are to be spaced and arranged.

III. *Rearrange the words given below so as to make up sentences:*

Model: the bricklayer, a trowel, the instrument, by, is called, used.→ The instrument used by the bricklayer is called a trowel.

1. work, the foundation, anchoring sills, by providing, is finished
2. of prefabs, a lot of, are built, houses
3. courses of bricks, consists, the building, together, of a wall, and bonding them, in laying down

IV. *Translate from Russian into English:*

1. Кладка наружных стен дома идет быстро, так как их собирают из готовых блоков и панелей. 2. Несколько лет тому назад перегородки, отделяющие в квартире одну комнату от другой, сооружали вручную, потом штукатурили и красили. 3. Теперь перегородки прокатывают из гипса, песка и опилок. 4. Затем их поднимают краном и устанавливают в квартире. 5. В настоящее время прокатывают железобетонные стены домов, которые в 5 раз легче и в 1,5 раза дешевле кирпичных.

V. *Fill in the blanks with a suitable form of the verb from the list:*

to equip, to furnish, to provide, to see, to make, to visit, to take, to be, to calculate, to consist of, to be built, to be placed, to be carried out

1. If you come to Moscow, be sure ... the Building Exhibition. 2. It is not a tiring trip and will not ... over two hours, but you are sure ... a great number of things that will interest you. 3. Near the central building of the Exhibition there ... a little orchard with a fountain and benches along the walks. 4. In this area several houses are located that are ... of light panels. 5. Between the panel slabs of compressed sawdust of rushes are ... to ... thermal and acoustical insulation. 6. The houses are ... with stoves or gas-heated. 7. They ... of two, three or four rooms, with or without a verandah, and are completely ... and ... . 8. In two of them I even ... the same sight — a cat sitting comfortably in an armchair. 9. The plans and estimates ... all available. 10. The future owners have only to ... their choice, ... their savings, determine the conditions under which construction work can be ..., and write down the appropriate addresses.

VI. *Translate the following sentences into Russian. Form verbs from the italicised nouns:*

1. The Second World War brought immense *destruction* of housing *facilities* in all socialist countries. 2. The ruins of Volgograd, Sevastopol, Minsk, Warsaw and many other towns which fell victim to the inhuman enemy *invasion* will never be forgotten. 3. Destruction was particularly enormous in the Soviet Union, Poland and a few other countries, and this required strenuous *rehabilitation* efforts. 4. In the postwar period the volume of housing and civilian *construction* in the socialist countries has been increasing from year to year.

TEXT 7B. THE CONSTRUCTION OF A BUILDING

Read the text and retell it in Russian:

A building is a construction which is raised on a foundation and is generally made of stone, concrete blocks, bricks and mortar or cement. Bricks and concrete blocks are held together by mortar. Walls made of bricks and those built of concrete blocks are suitable both for small buildings and multistorey structures. Nowadays houses are often built of complete concrete structural units which are factory-made and assembled on the spot.

Every detail of a house must be carefully planned. The working plan itself is called a blueprint. Without a blueprint the workmen would make all sorts of mistakes and waste a lot of time.

Plans for building a house are drawn by an architect. The architect draws a separate plan for each individual floor. He shows all the parts of the house exactly as if the house were already built.

It is from the blueprint of the architect that the workman sees where to place the walls, the windows, the doors, the staircases, etc. The size of the rooms, the width of the doors, and windows, the height of the ceilings are also marked on the plan by the architect.

Different workmen are employed in building a house. The stonemason builds the foundation. The bricklayer builds the walls and other parts made of bricks. He lays the bricks one on the top of another and puts mortar between them with a trowel. The slater or tiler is employed for putting slates or tiles on the roof. The plumber fixes all the baths, water pipes and the sanitary fittings of drains and lavatories in the places marked for them in the plan drawn by the architect. The electrician runs electric wires and makes connections all through the house from the cellars under ground to the attics under the roof. All the doors and window-frames are made by the carpenter and put into their places by the joiner. The latter also lays down the floor. Then the plasterer puts plaster or cement over all the walls and ceilings and makes them smooth. The walls are then painted, papered or whitewashed as the case may be.

Exercises

I. *Say in one or two sentences what the following people do:*

1. a miner
2. a doctor
3. a teacher
4. a builder
5. a tailor
6. a farmer
7. a pilot
8. a shoemaker
9. an architect
10. a turner
11. a driver
12. a painter
13. a carpenter
14. a photographer
15. a bricklayer
16. a locksmith
17. a mechanic
18. a weaver
19. an engraver
20. a barber
21. a writer
22. an actor
23. a singer
24. a professor
25. a welder
26. a baker
27. a plasterer
28. a house painter
29. a blacksmith
30. a watchmaker
31. a fisherman
32. a musician
33. a dentist
34. a student
35. a printer
36. a composer
37. a docker
38. a cook
39. a seaman
40. a fireman
41. a moulder
42. a building engineer
43. a designer

II. *Say a few words about the different professions of your kith and kin (friends and relations).*

7C. DIALOGUES

Repeat the tape-recorded dialogues after the speaker. Study the dialogues and read them in pairs. Point out which of the dialogues contain the most important information:

Dialogue 1

A.: What are the three materials most widely used in construction?
B.: I'm quite sure they are lime, gypsum and cement. Right?
A.: Right! Now tell me for what purpose these materials are used?
B.: They are used for the purpose of binding together masonry units.
A.: What kind of masonry units do you mean?
B.: I mean stone and brick. Don't you agree with me?
A.: Are those three materials used as constituents of wall plaster?
B.: They are, yes. All of them are used as constituents of wall plaster.

Dialogue 2

A.: What building materials are at present considered to be the most important ones?
B.: It goes without saying that structural steel and concrete are!
A.: May we consider concrete to be an artificial conglomerate?
B.: Yes, we may. But remember that it's an artificial conglomerate of crushed stone, gravel or similar inert material with a mortar.

Dialogue 3

A.: Can you tell me what the most accurate method of measuring proportions is?

B.: I can, yes! It is to weigh the required quantities of each material.
A.: And how do you think this may be done?
B.: Well, you see, this may be done if the proportions are based on volumes or weights.
A.: I'm sure this method is being extensively used. But where?
B.: In a lot of central mixing and in central proportioning plants.
A.: Where else is this method being used?
B.: It is also very widely used in large building construction.

Dialogue 4

A.: The chief control tests made on concrete are workability and strength, aren't they?
B.: Quite true! That is what a building engineer should always bear in mind.

Exercises

I. *Read the text and then state the tense and the form of the predicate in each sentence:*

In the current five-year period the quality of housing construction will be raised, apartments will be more comfortable and better planned. The urban development is in keeping with the development master plans. The amenities and architecture in towns and other populated areas will be improved. Their provision with central water supply systems will be ensured. The transition of domestic heating to major supply sources will be continued and utilizing gas will be increased. The volume of cooperative housing construction will be increased. The building of one-family houses in small towns, urban-type settlements in rural areas will be encouraged.

II. *Read the text and render it in Russian:*

The growth of the country's economic potential depends to a decisive degree on the state of capital construction. The Central Committee of the Communist Party and the Soviet Government devote exceptionally great attention to improving matters in this branch of the economy. Much is expected of the builders and designers in the current five years. Their duty is to ensure quality, efficiency and speed in designing and building, and to see to it that each project is commissioned on schedule, and that it is up-to-date in every respect.

Territorial-industrial complexes, such as the West Siberian, Sayany, Angarà-Yenisei, Timano-Pechora, South Yakutian, etc. will go on developing. Completion of the Baikal-Amur Railway will be a turning point in the economic fortunes of a vast region. Combatting no small hardships, the builders have performed a great and noble deed — they exceeded the targets of the Tenth Five-Year Plan, and have built hundreds of kilometres of roads, new towns and settlements, and dozens of production facilities. This provides a good basis for coping with the next set of tasks — opening through traffic all along the Baikal-Amur trunk line in the current five-year plan period.

III. *Speak on one of the following subjects:*

1. Apartment houses in the current five-year period.
2. The further development in the current five-year period.

IV. *Give nouns corresponding to the following verbs:*

to construct, to develop, to plan, to populate, to supply, to continue, to build, to settle, to house, to educate, to provide, to produce, to utilize, to study, to specialize, to train, to improve

7D. DIALOGUES

Listen to the tape-recorded dialogues and translate your part (A. or B.) into Russian:

Dialogue 1

A.: Why do you think such profound changes have taken place in the nature of city development?
B.: They have taken place under the influence of changing social systems, and also the progress of the productive forces.
A.: And I should add to what you've said, "the scientific and technical revolution."
B.: You've taken the words out of my mouth!
A.: The percentage of the people living in towns and cities continues to grow from year to year.
B.: Now mind you, the number of big cities is also growing fast.
A.: Did you know that our planet already has over 300 cities with populations greater than a million?
B.: I didn't know the exact number of such cities, but I did know that there were plenty of them.

Dialogue 2

A.: The other day I read an article which said that by the year 2000 there will be about 3,500 cities with populations greater than a million.
B.: So that means all those people will need homes to live in.
A.: Yes, that's true. As many as 600 million families will need new homes.
B.: What measures do you think must be taken to keep urbanization in check?
A.: These problems have been causes of concern to city fathers, town planners and the public for a long time now.
B.: I know that. But what measures do you think must be taken?
A.: Frankly, I really don't know.
B.: Neither do I.

Dialogue 3

A.: By the year 2000 there will be a large number of automobiles in the streets of our towns and cities, won't there?

B.: Of course, but don't think that there'll be more noise.
A.: Now look here, if there are more automobiles, there'll be more noise.
B.: You're mistaken! Most of the automobiles will run not on petrol, but they'll run on electricity!
A.: Really? How interesting!

UNIT 8. BUILDING A NEW LIFE

Grammar: Irregular Verbs (§ 25). Present and Past Perfect Tenses (§ 32). Numerals (§ 20). **There+to be** in the Present Indefinite Tense (§ 5).

TEXT 8A. NEW CITIES AND TOWNS IN THE SOVIET UNION

Listen to the tape-recorded text and then retell it:

Our Motherland is the Union of Soviet Socialist Republics founded by the Great Lenin. It consists of fifteen Union Republics. More than one hundred peoples and nationalities form the population of our great country.

The Soviet Union covers one-sixth of the world's land. The state frontiers are more than 60,000 kilometres long. Twelve states border on the Soviet Union. Twelve seas wash the coastline of our country over a length of 43,000 kilometres.

There are about 150,000 rivers, large and small, in the USSR. Large canals link up all the seas of the European part of the country.

For its reserves of minerals, the Soviet Union occupies a leading place in the world. It has huge deposits of coal, iron-ore, oil, gas, diamonds and phosphorites. Its forests cover vast tracts of land.

The Soviet Union abounds in everything that Nature gives man in order to enable him to build a happy communist society in the lifetime of the present generation.

Over a thousand new towns have appeared on the map of the USSR in the years of Soviet power. Many of the big cities have arisen since the October Revolution on "empty" spots, largely thanks to industrial development. For example, chemistry and petrochemistry provided the basis for Nizhnekamsk, Navoi or Angarsk, metallurgy gave us Taishet; the automotor industry prompted the growth of Togliatti, and so on.

A great many new towns have gone up in areas which were previously uninhabited. Very often a new city development appeared out of a small settlement or a large village. Lately cities are developing at an especially rapid pace around such research and experimental centres as Dubna and Obninsk near Moscow, and the Academic Township near Novosibirsk.

The building of a new city is a very complex undertaking. It involves scores of state institutions and a host of specialists — architects, economists, engineers, geographers, sociologists, hygienists, demographers, and many others.

Exercises

I. *Answer the following questions:*

1. Of how many Union Republics does our country consist? 2. How many peoples and nationalities form the population of our great country? 3. What is the population of the USSR now? 4. What part of the world's land does the Soviet Union cover? 5. How long are the state frontiers of our country? 6. How many states border on the Soviet Union? 7. How many seas wash the coastline of our country? 8. How many rivers are there in the USSR? 9. What natural resources is our country rich in? 10. How many new towns have appeared on the map of the USSR in the years of Soviet power? 11. What new cities and towns do you know that have appeared recently on the map of our country? 12. Have you ever been to one of these new cities or towns? 13. If you have, what impressed you most of all in the new city (town)?

II. *State the form and tense of the predicate in the sentences below:*

1. In the current five-year period mass-scale housing development is going on in the country. 2. The Party regards improvement of the housing conditions of the working people as one of the main tasks in improving the people's well-being. 3. The quality of house building is being raised and the amenities and planning of homes improved. 4. On the whole, millions of roubles are being invested in housing and public utility construction. 5. As before, most of the dwellings are built by the state. 6. At the same time, the development of housing cooperatives and individual house building in the smaller towns, workers' townships and rural areas are being encouraged.

III. *Give a loose translation of the following sentences:*

1. Главными районами интенсивного промышленного развития становятся Сибирь и Дальний Восток. Именно здесь особенно быстрыми темпами формировались новые города, среди которых Сургут, Усть-Илимск, Тында, Уренгой и другие. 2. За последние годы советские архитекторы накопили большой опыт (accumulated great experience) проектирования и строительства новых и реконструкции старых городов. 3. Мы создаем архитектуру нового мира. 4. Советская архитектура является новаторской (innovatory) и отвечает социальным и идейным тенденциям нашего общества, общества интернационального братства трудящихся, строящих коммунизм.

TEXT 8B. THE GREATEST EVENT OF THE 20TH CENTURY

Read the following text carefully two or three times. Make up as many questions as you can. Retell the text:

The October Revolution completely changed the course of history. With the October Revolution new pages in human history were written. After World War II the Soviet Union was no longer the world's only socialist country. It became the leading power in a new kind of alliance.

Cooperation among the socialist countries is the most dynamic economic force and a leading factor in world politics, opposed to reaction and considering preserving peace to be its main objective.

More than eighty per cent of the Soviet population was born after the Great October Socialist Revolution. Several generations know of the Revolution only from reminiscences, books and films. It is old people who still remember what unemployment meant.

V. I. Lenin, describing former social and political transformations in societies of different epochs, said that in all cases former political structures had not been subjected to such a radical change as that which took place in the Revolution of 1917.

Facts on Soviet economic development show the tremendous opportunities socialism offers. A country which before the Revolution produced slightly more than four per cent of world industrial output now produces 20 per cent. The Soviet Union produces more pig iron, steel, oil, iron, manganese and chromium ore, coal and coke, cement, diesel and electric locomotives, cotton, flax, mineral fertilizer and many other products than any other country. In two and a half days Soviet industry turns out as much as Russia did in all of 1913.

At present, three-quarters of the people working in the national economy have a secondary or higher education. It is a recognized fact that Soviet people read more than any other nation in the world. Soviet people want to continue building their society in peace. That is why one of the first decrees of the young Soviet state in 1917 was the Decree on Peace.

Exercise. *Render the following in English:*

За годы Советской власти в нашей стране построено свыше тысячи городов. Многие из них вырастают на востоке и севере страны. В районах Сибири и Дальнего Востока за пять лет возникло более десяти городов.

Городу Качканару всего семь лет. Качканар возник на Урале. Молодой город строится по четко продуманному плану. Главная цель этого плана — забота о человеке. Промышленная зона отделена от жилых микрорайонов необходимым расстоянием и широкой полосой леса. В городе возводятся многоэтажные дома, построены дворец культуры, большой спортивный комплекс. Средний возраст жителей Качканара — примерно 30 лет.

8C. DIALOGUE

Listen to the tape-recorded dialogue and then retell the contents in your own words. Divide the dialogue into logical units:

Small Towns Have a Future

A.: Is it true that nearly 80 per cent of the towns in the RSFSR are in the small or medium-sized category?

B.: Yes, it's true. I've read about that in the press.

A.: And you know, some small towns once played vital roles in the country's history.
B.: Sure they did, but subsequently lost much of their significance.
A.: Right! And other towns have just recently acquired urban status.
B.: That's very true. Their rapid progress indicates that they'll probably soon grow into cities in the full meaning of the word.
A.: They certainly will. Did you notice that with all their individual features, these towns have common features and common problems?
B.: Yes, I did notice that. How interesting, I should say!
A.: It is said that the growth of the big cities is not without limits. Do you think that's so?
B.: That's quite right, yes. Therefore, small and medium-sized towns are a principal means of improving the location of the country's productive forces.
A.: What has to be done to use this reserve properly?
B.: Well, I think comprehensive programmes for the urgent industrial development of the towns have to be elaborated.
A.: It goes without saying that they've got to be based on the importance of the country's economic regions too.
B.: Oh, naturally, they do. Such programmes are absolutely necessary if good results are to be achieved.
A.: Now there's something else I want to ask you. What about industrial enterprises?
B.: You mean future industrial enterprises, don't you?
A.: Of course, I do. Should they be listed so that they can be located in small and medium-sized towns?
B.: They should, yes. Besides, it is high time to improve the territorial organization of the construction industry.
A.: That goes without saying. It really is high time to do that.
B.: The interests of the economy demand that enterprises and individual shops be built in small and medium-sized towns.
A.: And construction facilities based in big cities should be used for building housing and public buildings in the small towns.
B.: Right! I fully agree with you in this respect. I really do.

8D. DIALOGUES

Memorize the dialogues and perform the conversation in pairs. Which of these dialogues contain the most interesting information for the builder?

Dialogue 1

A.: What do types of buildings depend upon?
B.: They all depend upon social formations.
A.: May buildings be classified in any way?
B.: Sure they may! Why not?
A.: Then tell me how they may be classified!
B.: They may be classified according to their role in the community!

Dialogue 2

A.: Do the type and the function of a building govern its design?
B.: They not only govern its design but they govern its building materials as well.
A.: What do you think are the common and necessary conditions?
B.: Well, a building has to be suitable to use by people in general.
A.: And what about its adaptability to particular human activities?
B.: That too, I should say, is very important.
A.: Don't you think the stability and permanence of its construction are also important?
B.: I do think they are of great importance!

Dialogue 3

A.: Can you say a few words about residential construction?
B.: I think I can. Dwelling houses are built to suit urban conditions.
A.: And group housing? What does group housing provide?
B.: You see, group housing provides homes for a lot of families.
A.: It is at once public and private, isn't it?
B.: Right! It is at once public and private!

Dialogue 4

A.: What two factors is the evolution of techniques conditioned by?
B.: The first is economic, the second is expressive.
A.: What do you mean by "economic"?
B.: By "economic" I mean the search for a maximum of stability and durability in building with a minimum of materials and labour.
A.: I see. And what do you mean by "expressive"?
B.: By "expressive" I mean the desire to produce meaningful form.

Dialogue 5

A.: What have large housing programs tended to stimulate in the building industry?
B.: As far as I know, they have tended to stimulate technological changes in the whole building industry.

UNIT 9. CITIES AND TOWNS

Grammar: Complex Sentences (§ 3). Passive Constructions (§ 30).

TEXT 9A. NEW LOOK FOR CITIES

Listen to the tape-recorded text and then study it. Translate the text into Russian:

Soviet builders and architects are trying to make new homes comfortable to live in, and convenient for carrying out domestic duties. New criteria of comfort have been established, and new standard project take a better account of climatic conditions and the regional style. The

list of standard flats has been extended, and their planning has been improved. The search for newer and even better types continues.

Hundreds of cities have sprung up all over the Soviet Union. Many conform to the most modern town-building requirements: Zelenograd near Moscow, Togliatti on the Volga, Shevchenko on the Caspian Sea, and Navoi in Uzbekistan. Navoi was a great humanist and poet. The city named after him stands between two of Central Asia's most ancient cities, Samarkand and Bukhara, the centres of Uzbek classical architecture.

In the years of Soviet power the number of cities has grown by more than 900. In the past few years alone, cities like Bratsk and Angarsk were built in Siberia; Volzhsk and Novo-Kuibyshevsk on the Volga; Rudny in Kazakhstan; Kakhovka in the Ukraine; Rustavi in Georgia; Sumgait in Azerbaijan. Volgograd, Minsk, Smolensk, Voronezh, Sevastopol and other cities that were razed to the ground in the war have been rebuilt completely.

New modern residential projects with broad streets, boulevards, and big squares, appear in the cities. Much attention is devoted to the planting of greenery. The narrow streets that were characteristic of the old urban planning have been done away with in the new districts. Planning and construction of residential projects is conducted along new lines. Neighbourhood units with a population of 6,000—8,000 are being newly-created. Houses are designed to provide more sun and air for living rooms, with an eye to convenient and beautifully planned communal park areas and playing space. Such community projects include all necessary cultural and welfare institutions.

Exercises

I. *Using the words of the text, speak about your home town.*

II. *Translate the following text into English at sight:*

В Подмосковье впервые в стране созданы сельские строительные комбинаты (house-building combines) (в Егорьевске, Подольске и Клину), которые выпускают строительные детали и конструкции. За годы Советской власти строители Подмосковья в городах и рабочих поселках возвели десятки сотен школ и детских учреждений, сотни больниц и санаториев. В Подмосковье выросли такие новые города, как Жуковский, Фрязино, Электросталь, Дубна и другие. А такие старые города, как Коломна, Дмитров, Серпухов, Подольск, Орехово-Зуево, Наро-Фоминск, Можайск, Клин подверглись коренной реконструкции.

III. *Render the following in English:*

1. 27 новых городов появилось на карте ГДР за три десятилетия после провозглашения республики. Население более чем 20 городов удвоилось, а некоторых городов выросло даже в десять раз. Число жителей Котбуса, Дессау, Геры, Йены и Шверина перешагнуло за сто

тысяч. Построены первоклассные автострады, плотины, водохранилища.

2. В некоторых капиталистических странах объем жилищного строительства постепенно падает. Так, городской комитет по градостроительству г. Бостона сообщает, что за последние 17 лет количество построенных домов резко уменьшилось. Чтобы удовлетворить потребность населения в жилье, необходимо ежегодно на протяжении трех лет строить не менее 20 тысяч домов.

TEXT 9B. NORILSK

Render the following text in Russian:

Norilsk is a handsome modern city of some 150,000 inhabitants and the largest community in the world nearest the North Pole. Fifty-two days a year the city goes without sunlight. In the long polar nights the winds are very strong.

Norilsk is now the world's No. 1 centre of the non-ferrous metals. The town was built not many years ago. Housing was quickly made available as engineers and architects learned how to build into permafrost soil, sinking deep holes 40 and 50 yards down into which fortified steel girders are lowered and concrete is poured around them.

Apartments there are considerably larger than elsewhere in the country. They are centrally heated to about 80 degrees and are more brightly lit than elsewhere to counteract the year's dark days.

Norilsk has movies and theatres, mostly amateur, in which the workers themselves perform. The Palace of Culture has an olympic swimming pool and an indoor skating-rink where even babies are taught to skate.

The Norilsk workers are given vacations of 45 working days a year for "normal" jobs and 50 days for the harder jobs in mines. Wages were set 50% higher than the norms elsewhere in the country.

Miners get full pensions after 10 years of work and upon reaching 50 years of age. Those who return to their former homes in better climate have housing priority.

Exercise. *Translate the sentences into English:*

1. Со всех уголков нашей страны молодежь стала стекаться на строительство города Шелехова. 2. На одной площадке были построены алюминиевый и кабельный заводы. 3. Сейчас в каждой квартире города водопровод. 4. Жители пьют чистую воду Байкала. 5. Сейчас возводятся новые корпуса заводов, строятся школы, детские сады, жилые дома. 6. Развивается экономика восточных районов нашей страны. 7. В ближайшее время в нашей стране будет построено 3 млрд. м² жилья. Вдумайтесь хорошенько: три миллиарда! Это в 15 раз превышает весь жилой фонд городов дореволюционной России. Это примерно 80 млн. квартир. 8. В нашей стране ежегодно более 11 млн. человек улучшают свои жилищные условия. 9. В прошлой пятилетке получили квартиры свыше 56 млн. человек. 10. Это же население такой страны, как Англия!

Self-Training Work

TEXT 9C. TWINNED TOWNS

In a few words express the main idea of each passage of the text:

The words "twinned towns" or "sister towns" are seen more and more often in the world press. There are fifty countries on several continents, affiliated to the United Towns Organization. The movement originated in the war. Moscow, Leningrad, which survived a siege of 900 days, Stalingrad, Odessa, Sevastopol, Kiev, Minsk, Novorossiisk and Brest, whose defenders earned glory by their staunch defence, won the title of Hero-City.

In the war, Soviet hero-cities made friends with towns in allied countries, which was the beginning of this democratic movement. Over the years the movement has grown, until today there are twinned towns in many places well beyond the bounds of Europe. In April, United Towns Day is being celebrated. Many Soviet towns are active in the United Towns Organization — Leningrad, Tashkent, Alma-Ata, Tbilisi, Baku, Vilnius, Riga, Dushanbe, Tallin, Volgograd, Rostov, Sochi, Yaroslavl, Kharkov, Odessa, Yalta.

In all Union Republics 120 towns have ties of friendship with 260 foreign towns. Their people learn more about the lives of people in their twinned towns, encourage cultural exchanges, help in the exchange on running public utilities. The twinned town movement encourages international friendship and understanding.

Not long ago Manchester saw an exhibition of drawings sent by the Hermitage and the Leningrad Russian Museum with great interest. A hundred drawings and water colours by English masters arrived at the Hermitage from the Whitworth Art Gallery, University of Manchester. The exhibition from Manchester gives an opportunity to see previously unknown excellent drawings and water colours by English 18th- and 19th-century artists, outstanding English masters of the time, such as Gainsborough, Constable, Romney, Bonington, John Millais and many others.

The Soviet exhibition in Manchester was very well received and was a major event in the cultural life of the English city.

TEXT 9D. A WORKERS' TOWN

Listen to the tape-recorded text. Find the key sentences in all the passages of the text:

Construction work is growing from year to year in our great country. We are now building thousands of new blocks of flats, schools, hospitals and a large number of industrial enterprises. A great percentage of the houses are constructed by housebuilding plants. This building method is successfully applied in different cities and towns of the Soviet Union.

The automobile workers' city, Naberezhnye Chelny, was built simultaneously with the Kama complex (six plants of which were built

at a site of 100 square kilometres — the casting, forging, chassis-pressing, engine assembly and repair-and-tool making). Each of the six plants of the complex represents the latest in the technology of automobile construction.

The new workers' town is already remarkable for its fine new houses, clubs, schools, shops, canteens, crèches and kindergartens. People of more than sixty nationalities came to work and live in this wonderful new Soviet town.

The Kama complex has become a school of work and life for many people. Kama trucks can be found in all parts of the country: from the virgin land development area to the tundra lying beyond the polar circle.

Exercises

I. *Look up the following words in the dictionary and find the original form of each word:*

casting, construction, simultaneously, nationalities, development, forging, pressing, industrial, successfully

II. *Translate the text in written form (15—20 min.).*

III. *Make up as many questions as you can about the text using the words* **when, what, where, how, who and why.**

IV. *Retell the text in English:*

Soviet specialists worked in close contact with the American assembly specialists in Naberezhnye Chelny. One of the Americans was interviewed.

Question: What are your impressions of our KAMAZ factory?

Answer: I have never seen such huge factories.

Q.: How do you get along with Russian workers and engineers?

A.: The Russian assemblymen are very skilled, and we've made good friends with them. I'm happy to work with such great guys.

UNIT 10. TO THE CAUSE OF THE REVOLUTION

Grammar: Prepositions (§§ 16—18). Conditional Sentences (§ 39). The Gerund (§ 47).

Self-Training Work

TEXT 10A. THE FOUNDER OF THE FIRST SOCIALIST STATE

Read the text and translate it orally:

No name is dearer to the Soviet people and the world's working masses than the name of Lenin. V. I. Lenin was the organizer of the Communist Party of the Soviet Union. He led our country to the victory

of the Great October Socialist Revolution, and was the founder of the world's first socialist state.

V. I. Lenin (Ulyanov) was born into a family of progressive Russian intellectuals on April 22nd, 1870. In those days the Ulyanov family lived in Simbirsk (now Ulyanovsk). All the six Ulyanov children were given a liberal education and brought up to be industrious, honest, modest and sensitive to the needs of people. They all became revolutionaries.

At an early age Vladimir faced very hard trials. In 1886 his father died quite suddenly. The family had hardly recovered from that blow when Alexander, Vladimir's elder brother, was arrested in St. Petersburg in March 1887 for taking part in an attempt to assassinate Tzar Alexander III. Two months later Alexander Ulyanov was executed.

In his early youth Lenin began a serious study of the revolutionary theory of Marxism, which teaches that only the working class can overthrow the power of capitalism and build a new social society. And Lenin devoted himself to the cause of the revolution. He was the first to put forward the great idea of an alliance between the working class and the peasantry.

Lenin's ideas have triumphed in several countries. And now increasing numbers of working people all over the world have turned and are turning their thoughts and aspirations towards Lenin. They realize that Leninism can provide answers to all the vital problems of our day.

TEXT 10B. THE KREMLIN STUDY

Read and translate the text in written form:

V. I. Lenin lived and worked in his Kremlin study during the most intensive period of his life.

In the Kremlin Lenin wrote some of his most important theoretical works: *The Immediate Tasks of the Soviet Government*, *"Left-Wing" Communism — an Infantile Disorder*, *A Great Beginning* and so on. Here he worked on the brilliant plan for the electrification of Russia and the transformation of her economy. From here he guided the defence of the Republic.

Working eighteen to twenty hours a day, solving current problems, Lenin found time to talk to visitors nearly every day. In his reception room people never waited more than five minutes.

The well-known American journalist Albert Rhys Williams, a communist, met Lenin several times, and he told of an interesting episode.

In 1919, a group of American journalists came to see Lenin. In the reception room they saw other people waiting: workers, peasants, statesmen, and even a couple of diplomats. This was rather unusual. The secretary apologized on Lenin's behalf and said he could not interrupt his conversation with an important visitor. Finally the door opened, and they saw a Russian peasant. Having said good-bye to him, Lenin explained to the waiting visitors: "You must understand. This is a far from ordinary man. I had to find out what he thinks about our policy

in the countryside. He is so intelligent and has such an original way of thinking that I lost track of time." At that moment, Williams concluded, they realized the source of Lenin's power and why people loved and trusted him.

In his study Lenin received communists from almost every country, as well as foreign ambassadors and businessmen.

Exercises

I. *Point out the suffixes in the following words and say to what part of speech the words belong. Translate the words into Russian:*

1. importance, important; 2. attractive, attraction; 3. theorize, theoretic; 4. immediately; 5. infantile; 6. beginner, beginning; 7. transformer, transformation; 8. economy, economic, economical, economically, economics, economist, economize

II. *Explain the meaning of the italicised words and word-combinations as they are used in the following text:*

In our country, rights and freedoms are *guaranteed*. Since 1930, the Soviet Union has had no *unemployment*. All Soviet citizens know they will have a job; not just any job, but one *in accordance with* their education, abilities and training.

Politically, our *society* is organized *in such a way* as to enable each person *to take part* in the *management* of his workshop, factory, or office through the trade unions, the Komsomol, and general meetings. In *the Supreme Soviet of the USSR*, which is the supreme legislative body, half the deputies are workers and collective farmers.

TEXT 10C. LENIN IN LONDON

Give an oral translation of the text. Copy out of each paragraph the sentences containing the most important information. Express the main idea of each logical unit and give it a title.

The London period of Lenin's life was tense and fruitful. Lenin worked vigorously and perseveringly for the creation of a Party of a new type. In London, during 1902—1903, Lenin produced eighteen issues of *Iskra* — from No. 22 to 38. Here in the building in Holford Square, in the library of the British Museum he wrote the pamphlet "To the Rural Poor" in which he developed the very important concepts of Marxism on the alliance of the working class and peasantry, on the development of the bourgeois-democratic revolution into a socialist revolution, on the hegemony of the proletariat, and many other important articles as, for example, "Why the Social-Democrats Must Declare a Determined and Relentless War on the Socialist-Revolutionaries".

Lenin made a thorough study of the life of British workers, the labour movement, the policy, science and culture of the country.

Krupskaya wrote that he studied "the living London". Lenin went everywhere where workers gathered, frequented the so-called "speakers'

corner" in Hyde Park. Despite his crowded schedule Lenin, wishing to be closer to the working class, accepted an invitation to conduct classes with a group of Russian workers — emigrants in London. The topic was the draft programme of the Russian Social-Democratic Labour Party.

In 1902 and 1903 Lenin addressed workers in Whitechapel, a working-class district.

V. I. Lenin and N. K. Krupskaya rented two small rooms on the first floor in an old house, 30 Hoford Square, near King's Cross Station, in the workers' district of Finsbury.

As other places in London's East End Finsbury was and still is an area of the city poor. The houses built for railway workers astounded Lenin by their bleak monotony — the soot-smutted façades of bare brick and the broken plaster of the first storeys seemed to lay bare the poverty and squalor. Pale-faced children played in the narrow backyards.

The house where Lenin lived in 1902—1903, the one in Holford Square, was destroyed by a nazi bomb in 1940. True, the London County Council, in compliance with the wishes of British workers, put up a memorial plaque on the semidemolished house:

"Vladimir Ilyich Ulyanov-Lenin (1870—1924), founder of the USSR, stayed here in 1902—1903."

Exercises

I. *Memorize the following dialogue:*

A.: On how many occasions did Lenin come to London?
B.: He came to London on five occasions.
A.: When did he first come to London and why?
B.: He first came to London in April 1902 to continue the illegal publication of *Iskra*.
A.: Right! And how long did he stay in London then?
B.: He stayed in London for a whole year.
A.: Did Lenin come again to London in July 1903?
B.: Yes, he did. That's when the Second Congress of the Russian Social-Democratic Labour Party had to be transferred from Brussels.
A.: Why did Lenin come to London in April 1905?
B.: He came to London to attend the Third Party Congress.
A.: What about April 1907? Did Lenin come to London then?
B.: He did. He came to London for the Fifth Party Congress.
A.: If I'm not mistaken, Lenin's last visit to London was in 1908.
B.: You are quite right. He came to London to do some special research work in the Reading Room of the British Museum.

II. *Learn by heart "He Towers Above All" by George B. Shaw:*

Lenin was a human being, but a human being who towered above his contemporaries, not only in Russia, but throughout the world, where he remained practically unknown for a long time.

You must not think that Lenin belongs to the past because he is now dead. Lenin's significance is such that should his attempt to introduce Socialism fail, then our present civilization will go under.

If others follow Lenin's methods, then a new era will open for us. We shall no longer be constantly threatened by catastrophy; a new epoch will begin which we can hardly imagine. If the future is with Lenin, then we can all be happy; but if the world goes on in the old way, then I shall leave it a very sad man.

Self-Training Work

TEXT 10D

Read the text and give each paragraph a title:

Karl Marx was born in Germany in 1818. He became an active Socialist. The government authorities made it difficult for him to work in Germany. So he moved to France and to Belgium. Then in 1849 he moved to London, where he lived for the rest of his life.

Marx was a young man of 31 when he arrived in London. The year before he and his friend Engels had written the famous *Communist Manifesto*. Engels also moved to England. But for many years he lived in Manchester. So Marx and Engels wrote letters to each other. In these letters they discussed many questions of economics, politics, history and philosophy. In 1870 Engels moved to London. Then the two friends were able to meet and talk every day.

The room where Marx worked had a big window looking out onto a park. All along the walls there were bookcases full of books. On top of the bookcases there were newspapers and manuscripts piled right up to the ceiling. Marx didn't let anybody tidy his books and papers. He knew exactly where everything was.

Marx loved children, he loved people, he loved life. He had the imagination of a poet, the patience of a scientist, the passion of a revolutionary. He called on the workers to unite, to overthrow capitalism and to build a new society in which the free development of each is the condition for the free development for all.

Marx died in London in 1883. He was buried in Highgate cemetery. Every year on March 14, the anniversary of his death, British Communists hold a meeting beside his grave. They honour the memory of Karl Marx, the founder of scientific communism.

Exercise. *Answer the following questions:*

1. When and where was Marx born? 2. When and why did he move to London? 3. How old was Marx when he and Engels wrote the famous *Communist Manifesto?* 4. When did Engels move to London? 5. Why didn't Marx let anybody tidy his books and newspapers? 6. Where and when did Marx die? 7. Why do British Communists hold a meeting beside Marx's grave every year on March 14th?

UNIT 11. BUILDINGS

Grammar: Compound Words (§ 55). Word Meaning (§ 6).

TEXT 11A. TYPES OF BUILDINGS

Read the text carefully and then render it in Russian:

The majority of building codes divide buildings into classes based upon the manner[1] of their construction, use, or occupancy[2].

The following division into classes applies to the manner of construction:

1. Frame construction[3].
2. Nonfireproof constructions:
   (a) Ordinary construction;
   (b) Slow-burning construction.
3. Fireproof construction.

Frame construction embraces all buildings with exterior walls of wooden framework sheathed[4] with wood shingles or siding; veneered[5] with brick, stone, or terra cotta; or covered with stucco[6] or sheet[7] metal. Such buildings naturally have floors and partitions of wood and are considered as comprising the most inflammable type of construction.

Nonfireproof construction includes all buildings with exterior walls of masonry[8] but with wood floor construction and partitions. **Slow-burning construction** designates[9] heavy timber framing designed as far as possible to be fire resistant, the heavy beams and girders of large dimension proving far less inflammable than the slender joists of **ordinary construction.**

Fireproof construction includes all buildings constructed of incombustible[10] material throughout, with floors of iron, steel, or reinforced concrete beams, filled in between with terra cotta or other masonry arches or with concrete slabs. Wood may be used only for under and upper floors, window and door frames, sash, doors, and interior finish. In buildings of great height the flooring must be of incombustible material and the sash, doors, frames, and interior finish of metal. Wire glass is used in the windows, and all structural and reinforced steel must be surrounded with fireproof material, such as hollow terra cotta and gypsum tile to protect the steel from the weakening effect of great heat.

Notes

1. **manner** — способ
2. **occupancy** — занятость; заселенность
3. **frame construction** — каркасная конструкция
4. **to sheathe** — обшивать
5. **to veneer** — облицовывать
6. **stucco** — штукатурка
7. **sheet** — лист(овой)
8. **masonry** — каменный

9. **to designate** — обозначать, означать
10. **incombustible** — несгораемый

Exercises

I. *Answer the following questions:*

1. What kind of buildings does frame construction embrace? 2. Does nonfireproof construction include buildings with exterior walls of wooden framework sheathed with wood shingles? 3. Is heavy timber framing connected in any way with slow-burning construction? 4. Can you say what is meant by ordinary construction? 5. Why is fireproof construction so important to man? 6. Must the flooring be of incombustible material in buildings of great height? 7. Where is wire glass used?

II. *Translate the following using a dictionary:*

Project supervision. The extent and type of supervision required during construction varies considerably with the project. For a small, compact project the supervision may be relatively simple, while a large project, which is spread out over considerable area, such as a dam or a major pipe line, may introduce many supervisory problems.

TEXT 11B. BEARING WALL AND SKELETON FRAME

Listen to the tape-recorded text and write out the sentences in the passive.

From the point of view of method of construction buildings may be divided into the following groups:
1. Bearing[1] wall construction;
2. Skeleton[2] frame construction.

Bearing wall construction has been the method of structural design employed from the earliest days. By this method the loaded floor and roof beams rest upon the exterior and interior walls, which in turn transmit the loads to the foundation. It is evident that the walls must be of sufficient[3] thickness to carry the loads as well as their own weight; consequently, as the height of buildings increased the required thickness of the walls and the weights brought upon the foundations became excessive[4] and uneconomical.

Skeleton frame construction has been made possible by the development of structural steel and later of reinforced concrete. According to this method the loaded floor and roof beams rest upon girders[5] running between the columns. The columns are placed along the building line and are known as exterior or wall columns; they also occur at required intervals within the body of the building, in which case they are called interior columns. A framework[6] is thereby formed, the walls being carried upon the wall girders at each storey level. The walls are consequently mere enclosures bearing no weight and are of the same thickness on all stories. The columns transmit the loads to the foundations.

Notes

1. **bearing** — несущий
2. **skeleton** — каркас
3. **sufficient** — достаточный
4. **excessive** — чрезмерный
5. **girder** — прогон
6. **framework** — ферма

Exercises

I. *Answer the following questions:*

1. Into what groups may buildings be divided from the point of view of method of construction? 2. Is bearing wall construction an old method of structural design? 3. Do the loaded floor and roof beams rest upon the exterior and interior walls by this method? 4. Are those loads in turn transmitted to the foundation? 5. Why must the walls be of sufficient thickness? 6. What happened as the height of buildings increased? 7. Are structural steel and reinforced concrete used in skeleton frame construction? 8. Upon what do the loaded floor and roof beams rest according to this method? 9. Can you explain the difference between exterior and interior columns? 10. How do you explain the fact that the walls are of the same thickness on all stories in skeleton frame construction?

II. *Translate the following sentences into Russian paying attention to the passive constructions:*

1. The design of the wall in modern steel-framed buildings is not seriously affected by structural considerations. 2. It is known that the wind load on a structure is influenced by its shape. 3. When any concrete work is to be carried out, the cheapest coarse aggregate which will give good results is chosen. 4. During recent years the value of aluminium as an architectural metal has been increasingly recognized. 5. The effect of additional insulation on the inside temperature was calculated. 6. Asphalt tiles are not affected by water.

TEXT 11C. FLOOR LOADS

Look up all the new words you find in the text in the dictionary. Translate the text:

Before calculating the required sizes of beams, girders, or columns to support the weights upon them it is necessary first to determine the weights or loads supported by the structure. These consist of the dead loads and the live loads. By dead load is meant the weight of the construction itself, the walls, floors, ceilings, roof, and permanent partitions. By live load is meant the weight of the furniture, equipment, occupants, stored material, snow on the roof, and movable partitions. The live loads should include all except the dead loads. Wind pressure, really a lateral load, is often classed as a live load but may be considered as producing a separate stress.

The various building codes specify the weights per square or cubic foot of wood, stone, steel, concrete, plaster, terra cotta, and other structural materials comprising the dead loads. They likewise regulate the live load per square foot, which depends on the use or occupancy of the building and which must be employed in calculating the weights upon the structural members.

Exercises

I. *Answer the following questions:*

1. What is meant by *dead load* and *live load*? 2. Is wind pressure often classed as a live load? 3. Can you enumerate some of the structural materials comprising the dead loads? 4. Do building codes regulate the live load per square foot?

II. *In the following sentences explain the meaning of the italicised words:*

1. We can easily lift great loads *by means of* helicopters. 2. Using helicopters *means* making the job easier on inaccessible construction sites. 3. The use of helicopters is an excellent *means* of placing in position building units on inaccessible construction sites. 4. *By no means* can long-wheel-base lorries be used on a building site where access conditions are difficult. 5. The *mean* speed of manipulating building cranes can easily be calculated. 6. Large-scale mechanization should be introduced into building practice *by all possible means.*

TEXT 11D. ROOF LOADS

Say in your own words what the text is about:

On flat roofs and those of slight pitch the snow load will be at the maximum and the wind pressure at the minimum. As the pitch of the roof increases, the snow load will decrease and the wind load increase. The Boston building law includes the following regulations:

Roofs shall be designed to support safely minimum live loads as follows:

Roofs with a pitch of 4 in. or less per foot, a vertical load of 40 psf of horizontal projection.

Roofs with pitch of more than 4 and not more than 8 in. per foot, a vertical load of 15 psf of horizontal projection, and a wind load of 10 psf of surface acting at right angles to one slope, these two loads being assumed to act either together or separately.

Roofs with pitch of more than 8 and not more than 12 in. per foot, a vertical load of 10 psf of horizontal projection, and wind load of 15 psf of surface acting at right angles to one slope, these two loads being assumed to act either together or separately.

Roofs with pitch of more than 12 in. per foot, a vertical load of 5 psf of horizontal projection, and a wind load of 20 psf of surface acting at right angles to one slope; these two loads are assumed to act together or separately.

The expected snow load naturally varies in different parts of the country, as exhibited by the requirements of the local building codes.

Exercise. *Underline the suffixes, state what part of speech they indicate and translate the following words into Russian:*

pressure, building, regulation, safely, vertical, projection, horizontal, separately, acting, requirement, structure, equipment, partition, structural, employment, specially, different, storage, reinforcement, central, directly, exception, nearly, limitation, construction, economic, insulation

UNIT 12. BUILDING MATERIALS (I)

Grammar: Modal Verbs (§ 28).

TEXT 12A. THE PROPERTIES OF BUILDING MATERIALS

Repeat the tape-recorded text after the speaker:

Materials that are used for structural purposes should meet several requirements. In most cases it is important that they should be hard, durable, fire-resistant and easily fastened together.

The most commonly used materials are steel, concrete, stone, wood and brick. They differ in hardness, durability and fire-resistance.

Wood is the most ancient structural material. It is light, cheap and easy to work. But wood has certain disadvantages: it burns and decays.

Stone belongs to one of the oldest building materials used by man. It is characteristic of many properties. They are mechanical strength, compactness, porosity, sound and heat insulation and fire-resistance.

Bricks were known many thousands of years ago. They are the examples of artificial building materials.

Concrete is referred to as one of the most important building materials. Concrete is a mixture of cement, sand, crushed stone and water.

Steel has come into general use with the development of industry. Its manufacture requires special equipment and skilled labour.

Plastics combine all the fine characteristics of a building material with good insulating properties. It is no wonder that the architects and engineers have turned to them to add beauty to modern homes and offices.

All building materials are divided into three main groups: 1) Main building materials such as rocks and artificial stones, timber and metals. 2) Binding materials such as lime, gypsum and cement. 3) Secondary or auxiliary materials which are used for the interior parts of the buildings.

We use many building materials for bearing structures. Binding materials are used for making artificial stone and for joining different planes. For the interior finish of the building we use secondary materials.

Natural building materials are: stone, sand, lime and timber. Cement, clay products and concrete are examples of artificial building materials.

Exercises

I. *Answer the following questions:*

1. What are the properties of the building materials? 2. What are the most commonly used building materials? 3. Do building materials differ from each other? 4. What can you say about the most ancient building materials? 5. What can you say about bricks? 6. Is concrete an artificial or natural building material? 7. Into what groups do we divide building materials? 8. Can you give an example of a binding material? 9. What artificial building materials do you know? 10. What natural building materials do you know?

II. *Render the following in English:*

Пластмассы как материал для строительных конструкций

Пластмассы — это материал, который состоит из полимеров или их сочетаний. Большая легкость, значительная прочность, водостойкость являются основными достоинствами большинства пластмасс. Эти свойства пластмасс позволяют создавать легкие, прочные, красивые, экономически выгодные конструкции.

Основными компонентами пластмасс являются синтетические смолы. Эти смолы представляют собой высокомолекулярные соединения, полученные путем синтеза из низкомолекулярных соединений. Уголь, торф, нефть являются основным сырьем для смол. Смолы — это полимеры. Полимеры — это гигантские молекулы, которые состоят из тысяч малых молекул — мономеров.

12B. DIALOGUES

Repeat the tape-recorded dialogues after the speakers. Memorise them and then perform the conversation in pairs:

Dialogue 1

A.: Plastics have appeared comparatively recently, haven't they?
B.: It goes without saying that they have.
A.: Why is it that they've found a wide application in building?
B.: Not only in building. They've found a wide application in many industrial fields.
A.: How interesting! I'm sure its because of their inherent valuable and diverse properties. Don't you think so?
B.: You are quite right! Plastics possess valuable and diverse properties.

Dialogue 2

A.: How are plastics divided in respect to their properties?

B.: They are divided into rigid, semi-rigid, soft and plastic.
A.: And in respect to the number of constituents?
B.: You see, in respect to the number of constituents they may be classified as simple and complex.

TEXT 12C. TIMBER

Study the text and then translate it orally using a dictionary:

Timber is the most ancient structural material. In comparison with steel timber is lighter, cheaper, easier to work and its mechanical properties are good. On the other hand, timber has certain disadvantages. First, it burns and is therefore unsuitable for fireproof buildings. Second, it decays.

At present an enormous amount of timber is employed for a vast number of purposes. In building timber is used too.

Timber is a name applied to the cut material derived from trees. Timber used for building purposes is divided into two groups: softwoods and hardwoods. Hardwoods are chiefly used for decorative purposes, as for panelling, veneering in furniture, and some of them are selected for structural use because of their high strength and durability. In modern construction timber is often used for window and door frames, flooring, fences and gates, wallplates, for temporary buildings and unpainted internal woodwork.

Timber cannot be used for either carpenters' or joiners' work immediately it has been felled because of the large amount of sap which it contains. Most of this moisture must be removed, otherwise the timber will shrink excessively, causing defects in the work and a tendency to decay. Elimination of moisture increases the strength, durability and resilience of timber.

Exercise. *Answer the following questions:*

1. Is timber a very ancient structural material? 2. What are the advantages of timber in comparison with steel? 3. What are the disadvantages of timber in comparison with steel? 4. Into what two groups is timber, used for building purposes, divided? 5. For what purposes are hardwoods chiefly used? 6. For what purposes is timber often used in modern construction? 7. Why cannot timber be used for either carpenters' or joiners' work immediately it has been felled? 8. What increases the strength, durability and resilience of timber?

TEXT 12D. STONE

Repeat the tape-recorded text after the speaker:

Stone has been used as a structural material since the earliest days. Almost all famous buildings of classic times, of the medieval and Renaissance periods and of the eighteenth and early nineteenth centuries were erected of stone. The art of making any structure in stone is called stone masonry. In some places stone was used because of the scarcity of timber, but in other places stone was preferred because of its durability.

The stones which are usually used for masonry work are as follows: 1. *Granite.* Granite is very hard, strong and durable. It is used particularly for basements, base courses, columns and steps and for the entire façades. Its colour may be gray, yellow, pink or deep red. 2. *Sandstone.* Sandstone is composed of grains of sand or quarts cemented together. Sandstones form one of the most valuable materials. The durability of sandstones depends very largely upon the cementing material. Thus there are different kinds of sandstones. Many sandstones are exceptionally hard and are selected for steps, sills, etc. It is an excellent material for concrete aggregate. 3. *Marble.* Marble is a crystalline stone chiefly used for decorative purposes. White and black marbles are used for ornamental decoration where the beauty of the marble is shown to its best advantage.

Exercises

I. *Answer the following questions:*

1. Do you know that stone has been used as a structural material since the earliest days? 2. What is called stone masonry? 3. Why did people begin to use stone? 4. Can you name the stones used for masonry work? 5. Granite is usually used in construction, isn't it? 6. Does granite possess any special properties? 7. Can you say what these properties are? 8. What does the durability of sandstone depend upon? 9. Why are many sandstones selected for steps, sills, etc.? 10. Marble is chiefly used for decorative purposes, isn't it? 11. White and black marbles are widely used for ornamental decoration, aren't they?

II. *Complete the following sentences using English equivalents instead of the Russian words and word-combinations.*

1. Stone has been used as a structural material since древних времен. 2. The art of making any structure in stone is called каменная кладка. 3. Granite is used particularly for фундаментов, колонн, ступеней и т. д. 4. Sandstone is composed of зерен песка и кварца. 5. Sandstone is an excellent material for заполнителя бетона. 6. Sandstones form one of the most ценных материалов. 7. Limestones are used extensively for строительных целей. 8. Marbles are chiefly used for декоративных целей.

III. *Give the meaning of the text in English in two or three sentences.*

Существует три условия долговечности камней в постройках:

1) добывание их в карьерах невзрывным способом с обработкой инструментами без разрушения структуры; 2) отбор камней с более замкнутой системой пор и с преобладанием макропор над микропорами; 3) ограждение каменных элементов на фасадах зданий от пыли, грязи путем сглаживания поверхности или покрытия их специальными защитными средствами.

Кроме перечисленных причин коррозии, наблюдается разрушение камня в результате покрытия фасадов зданий плотными штукатурка-

ми и покраской. Отмечается особенно вредное влияние цементных штукатурок из-за их незначительной воздухо- и паропроницаемости. В настоящее время установлено, что известковые растворы для кирпичных стен обладают преимуществами перед всеми другими, которые употребляются для кладок, штукатурок, расшивок швов и облицовок.

12E. DIALOGUES

Memorize these dialogues and perform them in pairs.

I. — What do you know about cement?
— It's a powder which, when mixed with water, becomes hard like stone.
— Suppose we mix cement with sand and stones?
— If we mix cement with sand and stones, we get concrete.

II. — Do you know what a brick is?
— Yes, I do. It is a block of baked clay.
— What are bricks chiefly used for?
— They are chiefly used for building houses.

III. What kind of a building is called a "skyscraper"?
— A skyscraper is a very, very tall building.
— How tall are some skyscrapers?
— Some are so tall that their tops are hidden by clouds when it rains.

IV. — Suppose you wanted to make some concrete, what would you take?
— I'd take some cement, gravel and sand. Then I'd mix them with water.
— Quite right! Now, what is concrete used for?
— It's used for building, making roads, etc.

V. — What is a lift?
— It's an apparatus for taking people up or down to another floor.
— Do the Americans call this apparatus a lift?
— No, they don't. They call it an elevator.

VI. — How long does it take to build such a house?
— It takes about ten or eleven months.
— How long did it take to build the house you live in?
— I suppose it took about a year and a half.

VII. — What do we call a number of rooms on one floor of a building?
— If the rooms are used as a home, then we call the rooms a flat.
— And what is an apartment?
— In England they use the word "flat", while in America they use the word "apartment".

UNIT 13. BUILDING MATERIALS (II)

Grammar: Word-building (§§ 50—55). Infinitive Constructions (§§ 45—46). Participle Constructions (§ 42).

TEXT 13A. METALS AND CONCRETE

Repeat the tape-recorded text after the speaker.

All metals are divided into ferrous metals and non-ferrous metals. Ferrous metals include iron, steel and its alloys. Nonferrous metals are metals and alloys the main component of which is not iron but some other element. Metals, in general, and especially ferrous metals are of good importance in variations.

Metals possess the following properties: 1) All metals have specific metallic lustre. 2) They can be forged. 3) Metals can be pulled. 4) All metals, except mercury, are hard substances. 5) They can be melted. 6) In general, metals are good conductors of electricity.

These characteristics are possessed by all metals but the metals themselves differ from one another. Steel and cast iron are referred to the group of ferrous metals. Cast iron is the cheapest of the ferrous metals. It is chiefly used in building for compressed members of construction, as the supporting members.

When an engineer designs a steelwork he must carefully consider that the steel frame and every part of it should safely carry all the loads imposed upon it. The steel framework must be carefully hidden in walls, floors and partitions. It is steel and metal that is employed as reinforcement in modern ferroconcrete structures. In the curriculum of the Institute there is a special course on metal structures.

Steel. There are different kinds of steel. Alloyed steel (or special steel) is corrosion-resistant steel. This kind of steel is widely used in building. Stainless steel is also corrosion-resistant steel. It is used for cutlery, furnace parts, chemical plant equipment, valves, ball-bearings, etc.

Non-Ferrous Metals. Non-ferrous metals have the following characteristics: high electric and heat conductivity, high corrosion resistance, non-magnetic qualities, light weight.

Aluminium. This is the oldest and best known light metal. It is used in aircraft, automobile, chemical and some other industries.

Copper. Copper is the best conductor of electricity. There are different alloys with copper. An alloy of copper and tin is called bronze. This metal is often used for making various ornaments.

Exercise. *Answer the following questions:*

1. What do ferrous metals include? 2. Is iron the main component of non-ferrous metals? 3. What properties do metals possess? 4. Do the metals themselves differ from one another. 5. Is cast iron the cheapest of the ferrous metals? 6. What must an engineer carefully consider when he designs a steelwork? 7. Where must the steel framework be carefully

hidden? 8. Is alloyed steel corrosion-resistant steel? 9. What is it used for? 10. Is aluminium the oldest and best known light metal? 11. Do you know that the best conductor of electricity is copper? 12. An alloy of copper and tin is called bronze, isn't it?

TEXT 13B. ALUMINIUM IN STRUCTURES

Read the text and then render it in Russian:

Aluminium is not a new material. Probably the first example of large-scale structural use of aluminium was in 1933 when the floor steelwork of a large road bridge in Pittsburg, Pennsylvania, was replaced with aluminium and the resulting saving in dead weight — about 1 ton/ft run — enabled the bridge to carry with greater safety the increased loads of modern traffic. Apart from the construction of aircraft, aluminium has thus a structural history of about only half a century. Extensive use of aluminium in buildings such as aircraft hangers did not occur until about 30 years ago.

In many ways aluminium has been slow in making progress, mainly because of its cost; it is produced by electrolytic means which requires cheap hydro-electric power. About 10 units of electricity are required to make 1 lb. New reduction plants of large capacity have been coming into service in many parts of the world and these provide increased production with improved efficiency. The use of aluminium in structures may well expand in corresponding manner as simultaneous advances are being made with the development of improved aluminium materials and products.

The principal virtues of aluminium are lightness combined with strength and freedom from corrosion. The extent to which the latter two properties are developed depends on the alloy concerned.

The advantage of lightness — one-third the density of mild steel with nearly the same strength — is particularly of value where weight saving is of importance — in lift bridges, long span roofs, dome roofs, crane jibs and in a wide range of moving and portable structures.

TEXT 13C

Read the following sentences and then make a short report in Russian about aluminium:

1. Aluminium alloys can possess the strength of steel, though only a third the weight. 2. Cows give more milk when there are cool, heat-reflecting aluminium roofs on their dairy barns. 3. Aluminium offers a bright hope for energy conservation. 4. In direct contact with a heat source, aluminium is an excellent conductor. 5. World's lightweight champion in the long-distance transport of electricity, aluminium has virtually replaced heavier copper in high-voltage power lines. 6. Nearly indestructible, aluminium can be remelted over and over. 7. Aluminium is alloyed with small amounts of other metals. 8. Copper adds strength; magnesium imparts additional marine-corrosion resistance. 9. Unlike

copper or iron, aluminium does not occur naturally in metallic form. 10. Aluminium exists only in combination with other elements, primarily oxygen, with which it forms an extremely hard oxide known as alumina. When tinted by traces of other elements, alumina can take the form of gems such as rubies and sapphires. 11. Constituting 8 per cent of the earth's crust, aluminium is the most abundant of metals, as well as one of the hardest to produce. 12. Even fly ash from coal-burning furnaces could become a source of aluminium. 13. Subduing the waves, aluminium alloys not only combine lightness with strength but stoutly resist salt water's corroding effect. 14. When we recycle aluminium, we save 95 per cent of the energy needed to make new metal from bauxite. 15. Once you make aluminium it becomes an energy bank that you can tap over and over again. 16. The uses of aluminium are almost illimitable. 17. Aluminium panels sheathe the World Trade Center in New York. 18. Builders can use aluminium nails, screws, and bolts to install aluminium storm doors, screens, flashing, gutters, downspouts, shingles, awnings, and venetian blinds — some 200 building products in all. 19. In 1884, when aluminium was still as valuable as silver, a hundred-ounce tip of the metal was chosen by architects to finish the 555 ft high Washington Monument in Washington, D.C., USA.

Exercises

I. *Answer these questions:*

1. Can aluminium alloys possess the strength of steel? 2. Is aluminium an excellent conductor when it is in direct contact with a heat source? 3. Has aluminium replaced copper in high-voltage power lines? 4. Do you think aluminium can be remelted over and over? 5. Does copper add strength when it is alloyed with aluminium? 6. Is it true that aluminium exists only in combination with other elements? 7. When combined with oxygen, what does aluminium form? 8. Aluminium is not the most abundant of metals, is it? 9. Do aluminium alloys resist salt water's corroding effect? 10. Are the uses of aluminium almost illimitable? 11. How many building products are now made of aluminium? 12. Was there a time when aluminium was as valuable as silver?

II. *Read the dialogues and use the conversations in pairs.*

Dialogue 1

A.: What can you say about aluminium as a structural material?
B.: You see, aluminium has many attractions as a structural material.
A.: Can it be readily obtained in various alloys?
B.: Yes, it can be readily obtained in various alloys.
A.: And can it be obtained in various conditions and shapes?
B.: It can — to suit specific uses.
A.: You haven't said anything about aluminium's reliability.
B.: Oh, there is sufficient experience now to have confidence in its reliability.

Dialogue 2

A.: Aluminium alloys of very high strength are obtainable, aren't they?
B.: They are, but such alloys are not generally used in structural engineering.
A.: Is corrosion from sea air or industrial pollution a problem?
B.: No, corrosion from sea air or industrial pollution is no longer a problem.
A.: So that means that painting is not necessary?
B.: You are right. Painting is not necessary at all.

Dialogue 3

A.: I've heard that aluminium lends itself particularly well to roofing. Is that so?
B.: Yes, that's so. Aluminium is a wonderful roofing material!
A.: But it must be very expensive. Don't you think so?
B.: It is rather expensive, but there are many instances where aluminium structures justify themselves.

Dialogue 4

A.: Do you agree that an aluminium domed roof makes it simple to provide lighting in the walls beneath?
B.: I do. Besides, the domes can be assembled at ground level and lifted into position.
A.: That's remarkable! Don't you think dome roofs pack economically for sea transport?
B.: It's exactly what I was going to tell you.

TEXT 13D. CONCRETE (I)

Find the key sentences in all the passages of the text:

It is difficult to imagine modern structure without concrete. Concrete is the very building material which led to great structural innovations. The most important quality of concrete is its property to be formed into large and strong monolithic units. The basic materials for making concrete are cement, aggregate and water. Cement is the most essential material and the most important one for making concrete of high quality. Cement is made of limestone and clay. It is burnt (calcined) at high temperature and ground up into powder. Depending on the kind and composition of the raw materials different types of cement are obtained. Portland cement, blast furnace cement are suitable for putting up marine structures.

Concrete is made by mixing cement, water, sand and gravel in the right amount. As soon as it is thoroughly mixed it is poured into forms that hold it in place until it hardens. The crystals forming in the process of making concrete stick together in a very hard artificial stone. Cement starts hardening one hour after the water has been added and the process of hardening lasts for about twenty-eight days. The process is called concrete curing.

The characteristics of concrete depend upon the quality of the materials used, grading of the aggregates, proportioning and amount of water. The most important requirements for concrete are: it should be hard, strong, durable, fire-resistant and economical. Concrete can be divided into two classes: mass or plain concrete and reinforced concrete (ferro-concrete) where it is necessary to introduce steel. Plain or mass concrete can be used for almost all building purposes. Ferro-concrete is used in building bridges and arches, dams and dock-walls, for structures under water, for foundations, columns, girders, beams. The use of concrete and ferro-concrete is almost universal.

Builders now produce two types of new building materials: alkali-slag concrete and silica concrete. In alkali-slag concrete cement is replaced by a mixture of granulated blast-furnace slags and sodium and potassium compounds. The fillers can be sand or sandy loams containing various amounts of clay, which usually cannot be used with conventional cement. The new material has been tested successfully and is now being used for irrigation systems, roads, pavements and other structures. Silica concrete is light, fire-resistant and acid-proof. It contains no cement whatever. Silica concrete is widely used in aviation and in under water constructions.

Exercise. *Answer the following questions:*

1. Is it possible to put up modern structures without using concrete? 2. Do you know what the most important quality of concrete is? 3. The basic materials for making concrete are cement, aggregate and water, aren't they? 4. What is the most essential material for making concrete? 5. Can we make cement if we take limestone and clay? 6. How is cement made? 7. What are Portland and blast furnace cement suitable for? 8. When does cement start hardening? 9. How long does the process of hardening last? 10. Can you tell us what process is called concrete hardening? 11. Are you able to say what the characteristics of concrete depend on? 12. Should concrete be hard, strong, durable, fire-resistant and economical? 13. Into what two classes can concrete be divided? 14. Is the use of concrete and ferro-concrete most universal? 15. Do builders now produce two or three types of new building materials? 16. Where is silica concrete widely used?

TEXT 13E. CONCRETE (II)

Shorten the text by omitting what is unessential:

The term "concrete" is used to describe a dense material composed of cement and aggregate mixed with water. The density of such a material, and therefore many of its properties, depend upon the density of the aggregate. Therefore there is a broad division of concrete types into:

a) Dense concretes — composed of heavy aggregates.
b) Light-weight concretes — composed of light aggregates.

The aggregates are graded in size from fine to coarse in order to reduce the amount of void space to be filled by cement.

There are "cellular" concretes made by using materials which foam or form gas during the mixing of the concrete. These give a product of very light weight, because after setting it contains a large number of small voids.

The reduction in weight is accompanied by a considerable decrease in strength. Another type of light weight concrete is made by "entraining" air bubbles in the mix to which a substance has been added to keep the bubbles stable during setting.

REVIEW. *Render the following in English:*

1. Прочность хорошего кирпича, стали, природных камней со временем не меняется. 2. Бетон в течение длительного времени способен становиться прочнее. 3. Если принять прочность бетона за 100 процентов, то через $1^1/_2$ года она будет — 150, через 2 года — 200, а через 5 лет — 225%. 4. Плотный бетон морозостоек. 5. Прочность, водостойкость, плотность, морозостойкость делают бетон очень хорошим строительным материалом, пригодным для возведения гидротехнических сооружений. Бетон хорошо защищает от ударной волны и светового излучения. 6. Официальной датой появления железобетона считают 1867 год, когда французский садовник Ж. Монье получил первый патент на железобетон как строительный материал. 7. Ж. Монье делал из бетона цветочные горшки и кадки, небольшие бассейны для воды и другие изделия. 8. Первый железобетонный мост был построен в 1875 году. 9. Русские инженеры оказали большое влияние на развитие железобетонного строительства. Русские инженеры использовали железобетон как прекрасный строительный материал в Ленинграде, Новороссийске и других городах. 10. Несколько промышленных и гражданских зданий, выполненных частично из железобетона, сохранились и по сей день. 11. В 1904 году недалеко от Николаева был построен первый в мире железобетонный маяк. 12. С конца XIX века в строительстве получили широкое распространение бетонные конструкции, внедрение которых было тесно связано с промышленным изготовлением портландцемента. 13. Железобетонные изделия и сооружения появились после успешного использования стальной арматуры. 14. Железобетон как строительный материал очень молод.

Exercises

I. *Read the text carefully and then translate it:*

Concrete is made by binding together particles of sand and gravel, stone or broken brick. The binding agent used is a paste of Portland cement and water, in suitable proportions. When water is added to the cement, hydration takes place. This causes the whole mixture to set and harden, forming a solid mass. The sand, gravel (or broken stone) are termed "aggregate"; sand is known as "fine aggregate", and gravel as "coarse aggregate". Concrete can be made on a building site and poured into position as a wet mix, or it may be used as the material for making

prefabricated units in a factory. That is why there is another classification into "in-situ" (or cast-in-place) concrete and "precast" concrete.

II. *Answer the following questions:*

1. How is concrete made? 2. What takes place when water is added to the cement? 3. Does the whole mixture set and harden when hydration takes place? 4. A solid mass is formed, right? 5. Do you know what is termed "aggregate"? 6. Is sand known as "fine aggregate"? 7. And what is meant by "coarse aggregate"? 8. Can concrete be made on a building site and poured into position as a wet mix? 9. Are you able to explain what is meant by "in-situ" concrete?

III. *Put questions to the words given in bold type.*

1. **The water** used for mixing cements, limes and plasters must be reasonably clean. 2. Pond, river and canal waters often contain **vegetable and other organic impurities** and should not be used without examination. 3. Water fit for drinking can be assumed to be free from **harmful ingredients.** 4. Only sufficient water should be used to enable the hydration to take place and to make the mixture easily workable; any **excess** is detrimental to the ultimate strength of the concrete.

IV. *Ask and answer the questions about building materials used:*

The sand should be clean and free from clay and vegetable matter because when it is mixed with water and cement a chemical action takes place. Therefore, if impurities are present, the binding or adhesion is affected.

V. *Render the following in English:*

1. Легкие бетоны изготовляют на пористых естественных или искусственных заполнителях. 2. Легкие бетоны на пористых заполнителях применяют для изготовления панелей для стен, плит перекрытий и конструкций каркаса. 3. Конструкции из легких бетонов следует применять при отсутствии агрессивных воздействий. 4. Когда конструкции находятся в агрессивной среде (наличие агрессивных газов, паров, кислот и т. д.), мелкие трещины растянутой зоны бетона способствуют активному развитию коррозии арматуры. 5. Это приводит к снижению несущей способности конструкций. 6. Для борьбы с коррозией бетонных и железобетонных конструкций применяют плотные бетоны, кислотостойкие бетоны, полимербетоны. 7. Каменные работы выполняются при возведении фундаментов, стен, столбов, арок, сводов и других конструкций зданий и сооружений из естественных и искусственных материалов. 8. Расширение области применения гипса и легких бетонов позволило возводить каменные конструкции из гипсобетонных, пенобетонных и др. легкобетонных камней и плит. 9. Из асбестоцемента можно приготовить сборные панели для наружных стен, подоконники, облицовочные листы для внутренней и наружной отделки зданий и т. п.

VI. *Complete the sentences using the English equivalents for the Russian words in brackets:*

1. All metals are divided into (черные и цветные). 2. Ferrous metals include (железо, сталь и их сплавы). 3. Copper, aluminium and some other metals are referred to as (цветные металлы). 4. Metals in general, and especially ferrous metals are of (большое значение в строительстве). 5. All metals have specific metallic (блеск). 6. All metals, except mercury, are (твердые вещества). 7. All metals are good conductors of (электричества). 8. (Сталь и чугун) are referred to the group of ferrous metals. 9. (Чугун) is the cheapest of the ferrous metals.

VII. *Translate into English orally:*

1. Медь и алюминий относятся к цветным металлам. 2. Все металлы, кроме ртути, твердые вещества. 3. Сталь широко используется в строительстве. 4. Сталь используется как арматура в железобетонных конструкциях.

VIII. *Give a written translation of the following:*

1. Портландцемент в основном употребляется для изготовления наземных и подземных бетонных и железобетонных конструкций. 2. Бетон применяется в строительстве с глубокой древности. 3. В качестве вяжущих в древности использовали известь, глину, гипс и асфальт. 4. Егор Челиев впервые приготовил цемент в начале XIX в. 5. Изготовление цементов в Англии и Германии началось на несколько лет позже.

IX. *Listen to the tape-recorded text below and render it either in English or in Russian:*

Portland cement is a chemical product of fine grey powder form. It is made from chalk or limestone, and clay or shale, which are ground and mixed with water to form a paste known as "lurry". The mixture is then burnt in a kiln, from which it emerges in the form of small hard lumps, known as cement "clinker". The clinker is next ground to powder. During the grinding a small percentage of raw gypsum is added otherwise it would set too quickly.

X. *Give the comparative and superlative degrees of the following:*

big, long, late, heavy, strong, dry, short, interesting, beautiful, pleasant, important, little, large, good, bad, well

XI. *Retell the following in conversational Russian:*

A rapid-hardening cement has been developed at the Zdolbunov Cement and Tile Factory. Its formula includes sand and minerals which contain oxides of aluminium, iron calcium and magnesium, the mix being fired in kilns to clinker.

The new cement owes much of its quality to the combination of the constituent minerals and the manufacturing process. The setting time of the new cement is about 40 minutes. In the case of repair of a

foundation, for example, the structure is ready inside 40 hours. Furthermore, the new cement makes it possible to fabricate reinforced concrete products of high strength in field conditions.

The new material will effect a considerable saving in materials. At least 200 lb less cement will go to make every cubic yard of stiff concrete. As a result reinforced concrete products will become lighter. The new cement will have many structural applications and will soon be available on a commercial scale.

XII. *Read the following and then describe the behaviour of concrete:*

1. *Curing*. Concrete becomes hard by the chemical combination of cement and water, during which process it is necessary to prevent as far as possible evaporation of the water from the surface of the concrete; this is called "curing", and is accomplished by covering the concrete, as soon as it can be done without damaging the surface, with damp cloths, wet straw, wet sand, etc., kept wet by sprinkling, or by immersing in water.

2. *Hardening*. The strength of concrete under favourable curing conditions increases with age. Hardening is very rapid in the early stages, but continues more slowly for an indefinite period amounting to years.

XIII. *In the following two texts explain the meaning of the words and word-combinations given in bold type. Render the texts in English or in Russian:*

General Properties of Cement

All types of cement shrink during setting. In a normal concrete the amount of this shrinkage will depend **both** on the proportion of cement in the mix **and** the quantity of mixing water employed. **Provided** enough water is present to enable the chemical action of setting to take place, then the smaller the amount of water the less shrinkage there will be. The type of aggregate used has an appreciable effect upon **both** the amount of water **and** the amount of **aggregate** that can be mixed with given quantity of cement. Strength and durability of concrete are linked properties in that they are **both** associated with the low water-cement ration. **In addition to** the proportion of cement and the **water cement ratio** of a cement product, the method of curing will also affect the amount of shrinkage. Normally, **the slower** the drying **the less** shrinkage there will be. All cement products are liable to a considerable shrinkage during setting and hardening.

Strength

The important thing is the strength of the final cement product **rather than** the strength of the cement itself. The strength of the cement, however, gives some indication of the possible variation in the former, although the strength of the product will also depend upon the

type and grading of **the aggregate** used, the proportion of aggregate and other factors such as water cement **ratio** and quality of workmanship.

XIV. *Insert the needed words and groups of words:*

Portland cement is a ... product. It is made of ..., ... or ... . They are ... and ... with water to form a paste. The mixture is then ... in a kiln. The clinker is ground to ... .

XV. *The difference in setting times for the main varieties of cement are set out in the following table. Using the table, ask and answer the questions:*

1. Does the term "setting" relate to the stiffening of the mix due to chemical processes? 2. Is "hardening" a physical process? 3. Does the completion of the "final set" mean that the cement product will cease to change its properties?

Setting Times of Cement

Type of Cement	*Initial Set*	*Final Set*
Ordinary Portland Cement	Not less than 30 minutes.	Not more than 10 hours.
Rapid Hardening Cement	Not less than 30 minutes.	Not more than 10 hours.
High Alumina Cement	Not less than 2 hours and not more than 6 hours.	Not more than 2 hours after the initial set.

XVI. *Write a summary of the following in English:*

Мелкий заполнитель — песок — может быть речным или карьерным. И каждый раз у него свой цвет. Цемент также бывает разных цветов. Наиболее известен серый цемент. В декоративных бетонах применяют белые цементы и цветные (с добавкой красителя). Все конструкции из бетона и железобетона по способу выполнения можно разделить на монолитные, сборные и сборно-монолитные.

Сборные железобетонные конструкции изготовляют на специальных заводах, затем доставляют на строительную площадку и здесь монтируют.

Монолитные конструкции бетонируют непосредственно на месте строительства. Арматуру и бетон укладывают в заранее установленную опалубку.

REVIEW. *Translate the following text into Russian:*

From the History of Concrete

Mass or plain concrete dates from very early days. It was employed by the Egyptians, Romans and Greeks in the construction of aqueducts and bridges, in the construction of roads and town walls. Romans used

it even in under-water structures some of which have survived till our time. A large part of the Great Chinese Wall (the 3rd century before our era) was also built of concrete.

The concrete remains of the foundations of buildings built several thousand years ago have been found in Mexico. As cement was not known in those times, concrete was made of clay and later of gypsum and lime. Nowadays concrete is made in up-to-date machinery with very careful regulation of the proportion of the mix.

The idea of strengthening concrete by a network of small iron rods was developed in the 19th century, and ferro-concrete was introduced into engineering practice.

XVII. *Study the following text and then give it a title:*

Concrete — unlike many building materials — is equally a framing and an enclosing material. It can be used to construct a skeleton; it can also be used to construct a complete weathertight shell of floor, walls and roof. In this respect it is one of the few total building materials.

It is hardly surprising that for a long time reinforced concrete was treated in a similar manner to a steel frame, clad in some other material.

Steel needs protection from the external elements and from internal fire; concrete needs neither of these. Steel was a construction material of parts connected together; concrete could be handled to produce a monolithic structure including enclosing surfaces.

The present stage of evolution shows an appreciation of concrete as a total material.

XVIII. *Translate the following:*

At some place along the beam's horizontal axis — where the stress changes from compression to tension — there will be no stress. This place is known as the "neutral axis".

Here, then, we have the elementary principle of a reinforced concrete beam, since the stresses are applied similarly, but in concrete the deflection or bending is, of course, not so pronounced as that seen in india-rubber taken for our example.

XIX. *Listen to the tape-recorded text below and render it in Russian:*

Gas concrete containing fly ash and blast furnace slag is often used as structural material. The method of substituting heavy aggregates by light ones is a rather common practice today. There are several chemical reactions taking place during the air entrainment. Portland cement is widely used in building. Various concrete and reinforced concrete constructions are made from it. White Portland cement is used in exterior and enterior architectural and decorative finishing ornamental works.

XX. *Render the following in English and give it a title:*

По запасам древесины наша страна является самой богатой в мире. Особенно велики запасы хвойного леса, которые используются в

строительстве. Древесина обладает прочностью, имеет небольшую массу и малый коэффициент теплопроводности. Как строительный материал древесина имеет ряд существенных недостатков: легкая возгораемость, гниение, коробление и пр.

Полимеры — синтетические искусственные и природные смолы. Исходным сырьем для получения стекла служат кварцевые пески, сульфат натрия, известняк и др. вещества.

Новым строительным материалом являются ситаллы и шлакоситаллы (силикат-кристалл).

Бетон хорошо работает на сжатие и плохо на растяжение. Поэтому бетонные конструкции при небольших растягивающих усилиях разрушаются. Введение в бетон стальной арматуры позволило получить строительный материал — железобетон, в котором выгодно сочетается совместная работа бетона и стали.

Основными показателями механических свойств стали являются прочность, упругость и пластичность.

XXI. *Listen to tape-recorded text. Render the text in English or in Russian:*

Concrete. Concrete is an artificial stone. It is made by mixing a paste of cement and water with sand and crushed stone, gravel, or other inert material. After this plastic mixture is placed in forms, a chemical action takes place and the mass hardens. Concrete, although strong in compression, is relatively weak in resisting tensile and shearing stress which develop in structural members. To overcome this lack of resistance, steel bars are placed in the concrete at the proper positions, and the result is reinforced concrete. In beams and slabs the principal function of the concrete is to resist compressive stresses, whereas the steel bars resist tensile stresses.

UNIT 14. CONCRETE

Grammar: Present and Past Participle introduced by "when" (§ 43).

TEXT 14A. GAS CONCRETE

Listen to the tape-recorded text and then render it in English:

Lime and silica are ground together to very fine limits. The silicious material can vary considerably in its composition. Much use is made of such waste materials as fly ash from power-stations, blast furnace slag, as well as natural pozzolanas, pumice, etc. The degree of foaming in the gas concrete, and thus its specific gravity, is determined by the amount of aluminium powder or other agent added. The practical limits of the final density are between 13 and 90 lb. per cu. ft. If the gas concrete is allowed to harden on its own, it usually takes about three weeks before the final strength is achieved. It is more customary to accelerate the setting of the gas concrete by steam hardening it in autocla-

ves with superheated steam at about 140 lb. per sq. in. The steam hardening process takes about 15-20 hr. Air-cured gas concrete can be used for the manufacture of special components for the refrigeration industry. Such blocks are cast to special dimensions.

Gas concrete can be cast horizontally to form roomsized outer wall units.

It is possible to incorporate electric conduit pipes, piping for the cold and hot water systems and also drainage pipes. The units usually include windows and doors, and are reinforced by embedding steel mesh in the mix.

Gas concrete can be used as thermally insulating floor screeds or as an additional thermally insulating layer on top of a concrete roof.

Cast gas concrete is often used as the thermally insulating layer in "sandwich wall" units.

Gas concrete is often used as a thermally insulating layer when casting buildings by a continuous casting technique.

Exercises

I. *Answer the following questions:*

1. Which materials are used for the production of gas concrete? 2. How can the setting of gas concrete be accelerated? 3. Can you name the main purposes for which air hardening gas concrete is used? 4. Where can gas concrete be successfully used? 5. What can you say about cast gas concrete?

II. *Which are the nouns derived from the following verbs:*

to change	to mix	to practice
to damage	to crack	to set
to work	to cast	to consider
to affect	to pipe	to hydrate
	to insulate	to prefabricate
to cause	to accelerate	to divide
to contain	to achieve	to bind
to require	to compress	to distribute
to stress	to cure	to reinforce
to produce	to heat	to force
to protect	to place	to weigh
to develop	to transport	to concrete

III. *a) Explain the use of the gerund in the following sentences. b) Translate the sentences.*

1. Placing concrete in winter is not very complicated. 2. Even in winter you can achieve a proper strength gain in concrete, if you succeed in keeping the material warm and moist. 3. Before cooling, the concrete must be kept warm for several days.

TEXT 14B. STEAM TREATMENT PROCESS TO PRODUCE THERMOPLASTIC MATERIALS AND HYDRAULIC CEMENTS

Repeat the tape-recorded text after the speaker. Find in the text the key sentences:

This invention relates to the manufacture of thermoplastic materials and hydraulic cements from certain glass compositions. More particularly, this invention relates to the manufacture of such products through the steam treatment of glass powders in the alkali metal silicate composition field.

A thermoplastic material is one having the property of softening when heated and of hardening and becoming rigid again when cooled. Hence, such a material is normally hard at room temperature but will soften and become moldable, adhesive, and cohesive when heated to some higher temperature. This property of thermoplasticity is well-recognized in such organic materials as cellulose acetate, polyethylene, and vinyl polymers and in glasses at temperatures around and somewhat above the softening points thereof. The value of this property is apparent in the forming of articles through molding, pressing, extrusion, rolling, etc., and in forming composite structures, laminates, and the like.

A hydraulic cement is one that is capable of hardening under the influence of water. Hence, such a material, when mixed with water and allowed to stand, gradually sets up as a hard, massive solid structure. Portland cement is probably the best known material commercially of this type.

Exercises

I. *Read the following words:*

process, thermoplastic, hydraulic, particularly, alkali, silicate, rigid, adhesive, cohesive

II. *Give derivatives of the following words and translate them.*

to invent, to relate, to produce, to treat, to form, to mix, to press, cellulose, acetate, polyethelene, polymer, hydraulic

III. *Put questions to the text.*

IV. *Write a summary of the text.*

V. *Render the following in English:*

Бетон как строительный материал применялся еще в глубокой древности (in ancient times). С XIX столетия после изобретения новых гидравлических вяжущих (binding agents) в первую очередь портландцемента (Portland cement), бетон снова стал широко применяться для строительства различных интересных сооружений.

Русские ученые уже с конца XIX века уделяли большое внимание созданию плотного бетона (paid great attention to consolidated concrete development). Наибольшее развитие технология бетона получила после Великой Октябрьской социалистической революции, на-

чиная с 1924 года со времени первого крупного гидротехнического строительства — Волховстроя (since the first great hydrotechnical construction site — Volkhovstroy).

Вопросам общей технологии и теории бетонов, исследования физико-механических свойств, защиты бетонов от коррозии и повышения долговечности (increasing durability) посвящены работы ученых: А. Е. Десова, С. А. Миронова, В. В. Михайлова, Н. В. Михайлова, М. В. Москвина и др.

Бетон — один из важнейших строительных материалов во всех областях строительства (one of the most important building materials in all the fields of construction).

Для гидротехнических сооружений большинство изделий делают из бетона марки 300 и выше. Это балки и балочные плиты (beam slabs) перекрытий, пролетов (spans) более 6 м между быками. Некоторые сборные (precast) гидротехнические сооружения изготовляют из бетона марки 200. К бетону для гидротехнических сооружений предъявляются высокие требования (high requirements).

VI. *Translate the text in written form and prepare it for oral discussion:*

It is essential that the concrete be placed in its final position before the cement reaches its initial set. Concrete which has acquired its initial set should never be used. Most specifications usually require concrete to be placed within half an hour of its being mixed and once placed (and consolidated) it should not be disturbed. If timber shuttering is used, all sawdust should be removed. The concrete should be spread evenly and well rammed into any corners or spaces in the formwork (or shuttering).

VII. *Read the following text and give it a title:*

During the placing the concrete must be compacted efficiently. Care should be taken to ensure that the concrete is well rammed into corners. For reinforced-concrete work plain round steel bars are used to ram the concrete well. In order to smooth-off or finish concrete work after placing and compacting it, steel floats and trowels are used.

In order to replace hand-ramming, mechanical vibrators are now used for compacting concrete. This is especially so for reinforced concrete work, such as walls and for making mass-produced pre-cast units such as piles. The vibrators may be operated either electrically or by compressed air.

VIII. *Speak to each other about concrete, its quality and use.*

IX. *Change into the interrogative:*

1. Concrete is made by mixing cement, sand and gravel with water. 2. The characteristics of concrete depend on the quality of the material used. 3. Mass or plain concrete dates from very early days. 4. The idea of strengthening concrete was developed in the 19th century.

14C. DIALOGUES

Repeat the tape-recorded dialogues after the speaker. Study the dialogues and write down the sentences containing interesting information.

Dialogue 1

A.: There's something I want to ask you. May I?
B.: Sure, you may! Why not? Go ahead!
A.: What is the most important component of concrete?
B.: Do you mean to say that you don't know?
A.: Honestly, I don't! Tell me, please!
B.: OK, listen. The most important component of concrete is cement.

Dialogue 2

A.: May concrete be considered an artificial conglomerate stone?
B.: Certainly, it may! Why not?
A.: You know how it's made, don't you?
B.: Sure, I do. It's made by uniting cement and water into a paste.
A.: What about sand? Isn't sand used?
B.: Of course, sand is used! How can you make concrete without sand?

Dialogue 3

A.: Concrete has great compressive strength, doesn't it?
B.: Quite true, it has enormous compressive strength!
A.: Does it have great ability to withstand tension?
B.: Tension, you say? It has very little ability to withstand tension.

Dialogue 4

A.: Are lime, gypsum and cement widely used in building construction?
B.: It goes without saying that they are!
A.: For what purpose are they so widely used?
B.: They are used for the purpose of binding together masonry units.
A.: Masonry units? What kind of masonry units?
B.: Don't you know? Masonry units such as stone, bricks and terra cotta.

Dialogue 5

A.: What qualities does a brick building possess?
B.: A brick building is strong and durable.
A.: Do you consider a brick building to be weather resistant too?
B.: Naturally, I do! A brick building is weather resistant too.

Exercises

I. *Fill up the blanks with English equivalents:*

1. (Самым важным качеством) of concrete is its property to be formed into large and strong monolithic units. 2. Concrete is made by mixing cement, sand, gravel and water (в нужных количествах). 3. The characteristics of concrete depend (от качества используемых

материалов). 4. (Бетон применялся египтянами, римлянами) in the construction of aqueducts and bridges. 5. (Так как цемент не был известен в то время) concrete was made of clay and later of gypsum and lime.

II. *Listen to the pronunciation of the following words. Repeat them after the speaker:*

reinforced, tensional, tensile, rigid, peculiar, to pour, to gain, to subject, moisture, temperature, feature, medium, shrinkage

III. *Read and translate the following word-combinations:*

to put in position, to pour concrete, to lose strength, to come into practical application, to cause tensile strength, to undergo shrinkage, at the turn of the century

TEXT 14D. REINFORCED CONCRETE

Find the key sentences in all the passages of the text. Render the text in Russian:

Reinforced concrete is a combination of two of the strongest structural materials, concrete and steel.

This term is applied to a construction in which steel bars or heavy steel mesh are properly embeded in concrete. The steel is put in position and concrete is poured around and over it, then tamped in place so that the steel is completely embeded. When the concrete hardens and sets, the resulting material gains great strength. This new structural concrete came into practical application at the turn of the 19th century. The first results of the tests of the reinforced concrete beams were published in 1887. Since that time the development of reinforced concrete work has made great progress. And the reasons of this progress are quite evident. Concrete has poor elastic and tensional properties, but it is rigid, strong in compression, durable under and above ground and in the presence or absence of air and water, it increases its strength with age, it is fireproof.

Steel has great tensional, compressive and elastic properties, but it is not durable being exposed to moisture, it loses its strength with age, or being subjected to high temperature. So, what is the effect of the addition of steel reinforcement to concrete?

Steel does not undergo shrinkage or drying but concrete does and therefore the steel acts as a restraining medium in a reinforced concrete member. Shrinkage causes tensile stresses in the concrete which are balanced by compressive stresses in the steel. For getting the best from reinforced concrete the following consideration should be kept in mind:

1. For general use the most suitable proportions of cement and aggregate are: 1 part cement, 2 parts sand and 4 parts of gravel.
2. Only fresh water free from organic matter should be used for reinforced work. Sea water is not allowed.
3. Homogeneity of the concrete is a very important requirement.

Steel constructions with reinforced concrete have become the most

important building materials invented in centuries and they have given modern architecture its peculiar features.

Exercises

I. *Answer the following questions:*

1. Is reinforced concrete a combination of two of the strongest structural materials? 2. What is the process of making reinforced concrete? 3. When did this new structural concrete come into practical application? 4. Since when has the development of reinforced concrete work made good progress? 5. Can you name the properties of concrete? 6. Will you say a few words about the properties of steel? 7. Does concrete increase its strength with age? 8. What about steel? 9. Is it true that steel does not undergo shrinkage or drying but concrete does? 10. Shrinkage causes tensile stresses in the concrete, doesn't it?

II. *Make up sentences using the following words:*

to combine — combination; strong — strength — to strengthen; hard — to harden — hardness; tension — tensional; compression — compressive; durable — durability; to apply — application; to shrink — shrinkage

III. *What is the English for:*

1. применять термин; 2. заливать бетон; 3. набирать прочность; 4. быть опубликованным; 5. увеличивать, уменьшать прочность; 6. подвергаться усадке; 7. вызывать растягивающие усилия; 8. использовать железобетон

IV. *Complete the sentences using the English equivalents for the Russian words in brackets.*

1. The resulting material gains great strength when (он затвердевает). 2. At the turn of the 19th century new structural concrete (стал применяться). 3. Steel has great tensional, compressive and elastic properties but (со временем она теряет прочность). 4. Steel does not undergo shrinkage and therefore it acts (как сдерживающая среда). 5. Shrinkage causes tensile stresses in concrete which are balanced (сжимающими усилиями в стали).

V. *a) Write a summary of the text in English. b) Write a review of the recent developments in your field or research.*

Бетон — это искусственный материал. Его получают в результате формирования и затвердевания правильно подобранной смеси (вяжущего, заполнителей, воды и, в необходимых случаях, специальных добавок). Вяжущее в бетоне используют вместе с мелкими и крупными заполнителями.

В качестве заполнителей применяют самые различные сыпучие материалы (песок, шлак, щебень, гравий, керамзит). Чаще всего для получения бетона употребляют различный по величине заполни-

тель: от крупных кусков щебня до песчинок. В этом случае пустоты между крупными кусками щебня заполняются частицами меньших размеров. Кроме того, мелкие частицы обеспечивают относительную подвижность крупных частиц, необходимую для лучшей укладываемости бетонной смеси.

От плотности и объемной массы зерен заполнителя зависит объемная масса бетона. В зависимости от этих показателей бетоны подразделяются на особо тяжелые, тяжелые (обычные), легкие, особо легкие, теплоизоляционные.

В особо тяжелых (предназначенных для биологической защиты от радиоактивных излучений на предприятиях атомной промышленности) бетонах применяют специальные виды заполнителей, которые имеют повышенную объемную массу.

Особо тяжелые и тяжелые бетоны применяют как конструктивные материалы, например при сооружении покрытий дорог и аэродромных полей. Конструктивные бетоны предназначены для восприятия нагрузки, возникающей в конструкциях в процессе эксплуатации сооружения.

Сейчас в строительстве широко применяют ячеистые бетоны (пено- и газобетон), которые изготовляются только из вяжущего и песка и содержат множество мелких замкнутых воздушных пор (ячеек). В ячеистых бетонах зерна заполнителей заменены воздушными ячейками, это достигается или смешиванием бетонной массы (пенобетон), или применением газообразующих веществ, которые вспучивают бетонную смесь (газобетон). Наличие этих пор уменьшает массу бетона и повышает его способность удерживать тепло.

Дерево, металл, пластмасса боятся воды, а бетон, набирая прочность, способен твердеть под водой. Это свойство позволяет возводить из бетона на большой глубине такие сооружения, как фундаменты для маяков, молы, доки, каналы, нефтяные вышки, бассейны, морские причалы. В железобетонные коллекторы и трубы больших диаметров при необходимости заключают целые реки. Многие годы уложенный бетон продолжает набирать прочность.

VI. *Change the following into the past tense:*

Ready mixed concrete has added significantly to the resources of the concrete industry in Britain. It has helped architects, engineers, contractors and the ordinary citizen.

Close cooperation among the architect, engineer and contractor during the design is essential to achieve greatest economy. Materials, methods and budgets can be worked out for acceptable treatment of the façade.

UNIT 15. TYPES OF CONCRETE

Grammar: Compound Words (§ 55). Word Meaning (§ 6).

TEXT 15A. NEW TYPES OF CONCRETE

Expand the ideas of the two texts (a *and* b) *given below. Comment briefly on any aspect connected with concrete or with your research.*

a) Not long ago a new building material was born. Called alkali-slag concrete, most of its components come literally from under foot. Cement is replaced by a mixture of granulated blast-furnace slags and sodium and potassium compounds. The filler can be sand or sandy loams containing various amounts of clay, which usually cannot be used with conventional cement.

The new material has been tested successfully and is now being used for roads, pavements, irrigation systems and other structures. Specialists estimate that the use of alkali-slag concrete will help save hundreds of millions of rubles on the country's construction projects.

b) Chemically resistant concrete (кислотоупорный) may be sometimes used in the construction of structures attacked by chemically active media (среда), i.e. industrial, hydraulic and underground structures. It has been proposed to prepare a chemically resistant concrete using a binder (вяжущее), a vitreous sodium silicate (стекловидный силикат натрия). When such a vitreous silicate is dissolved in water, liquid (жидкий) glass is obtained. In order to assist in the solidification (затвердение) of the liquid glass and increase its water resistance certain elements are added to the concrete composition. They serve to neutralize the alkali (щелочь) in the liquid glass and convert it into a water-insoluble (нерастворимый) compound. Thus, during the course of the neutralization of the alkali, free silica is evolved (выделяется кварц) from the liquid glass in the form of a gel (гель) which serves as a binder.

Chemically resistant concrete has not found wide application because it is completely permeable to aggressive, corrosive solutions. The Soviet scientist V. P. Kirilishin decided to provide an improved alkali-metal-silicate based concrete. In accordance with his invention high-silica-alkaline glasses are practically insoluble in water even at elevated temperatures and are not suitable for the production of liquid glass. However, when subjected to heat in the presence of finely divided quartz sand, the high silica alkaline glass does show some water solubility and has the ability to crystallize into quartz on the finely divided particles of the quartz sand.

In the present invention the silica binding agent is not present in the form of a gel that has the more thermodynamically and chemically stable crystalline form of free silica, namely quartz. This leads to good chemical, physical, thermal and mechanical characteristics for the binder and the chemically resistant concrete.

REVIEW 1. *Translate into English:*

1. Железобетон — это вид бетона, полученного в результате сочетания бетона и стали. 2. Стальные стрежни и стальная арматура укладываются в нужном положении и заливаются бетоном. 3. Бетон затвердевает, схватывается и приобретает большую прочность. 4. Сталь не подвергается усадке, она действует как сдерживающая среда в железобетонном элементе.

REVIEW 2. *Render the following in English:*

Проблема снабжения строительными материалами в пустыне чрезвычайно остра. Даже обычный гравий приходится везти сюда за сотни километров.

Ячеистый бетон представляет собой разновидность легкого бетона с равномерно распределенными по всей массе материала замкнутыми воздушными порами (85%).

Пористая структура ячеистых бетонов достигается применением пено- или газообразователей.

По способу образования пористой структуры ячеистые бетоны подразделяются на пенобетоны и газобетоны.

Газобетон почти в два раза легче железобетона, из него удобно монтировать дома. Технология изготовления различных деталей проста и хорошо освоена. Уже действует первый завод по выпуску газобетона.

REVIEW 3. *Give titles to the separate paragraphs given below:*

1. The manufacture and use of ready mixed concrete requires skill and good organization. Some care and organization is also required of the user of ready mixed concrete. He must know what concrete he requires and when he needs it. He must also have available enough men and equipment to handle and place it when it arrives on the site.

2. To a large extent the strength is dependent upon the type of clay used and method of making, but with most types of brick there is also a considerable variation according to the temperature at which the bricks are burnt.

Where considerable loads have to be carried a strong brick is needed, but it should be remembered that the strength of a wall is derived from a combination of brick and mortar. Building regulations define the type of mortar to be used with bricks of varying strength to carry varying loads. Nowadays the majority of bricks are used in non-bearing walls.

REVIEW 4. *Listen to the tape-recorded text and explain why brickwork permitted to use bricks for different types of construction.*

It is well known that bricks are usually extremely durable although they may change in appearance after considerable exposure. The two chief causes of deterioration are frost and the crystallization of soluble salts. Brickwork below damp course level is not especially liable to frost damage. Chimneys, parapet walls and retaining walls are very much more severely exposed to both rain and frost.

REVIEW 5. *Give full answers to the following questions:*

1. Is it well known that bricks are usually extremely durable? 2. May they change in appearance after considerable exposure? 3. What are the two chief causes of deterioration? 4. Can you explain why brickwork below damp course level is not especially liable to frost damage? 5. Which parts of a building are most severely exposed to rain and frost damage? 6. Do you think that something could be done to lessen this damage?

TEXT 15B. CONCRETE STRUCTURES

Repeat the tape-recorded text after the speaker. Retell the text:

The world has suddenly become aware of the great resources of oceans and their potential for providing many of man's most pressing needs: energy, food, transport, minerals and waste-disposal. However the seas present an extremely hostile environment, requiring cooperative efforts by many engineering disciplines in order to achieve the necessary structures.

These structures must be strong, safe, durable and economical. Reinforced prestressed concrete meets these criteria extremely well for many of the proposed structures, both fixed and floating. These include drilling, breakwaters, ocean pipelines, offshore nuclear power plants; ocean bridges and tunnels; offshore airports and terminals; Arctic Ocean structures; barges, ships and floating stable platforms; offshore expositions and even cities; sea floor chambers etc.

Exercise. *Make up some sentences using the following words and word combinations:*

concrete durability, deep water, offshore, concrete structures, prestressed concrete, reinforced concrete, underwater structures

TEXT 15C. THE FIRST CONCRETE SKYSCRAPER IN THE WORLD

Read the text and then render it in English:

The first reinforced concrete skyscraper in the world was built in 1902—03 in Cincinnati, Ohio. The 16-storey structure demonstrated for the first time the safety and economy of reinforced concrete frames for high-rise construction, and was a vital stimulus for using reinforced concrete in fireproof construction.

Concrete was chosen as the structural material chiefly for economics; it offered the equivalent of steel frames in load bearing capacity and other physical properties, yet was somewhat lower in cost. Engineers all over the world watched with great interest as construction proceeded smoothly along its 16-storey route. Today this building is recognized by engineers as having revolutionized the building industry.

Exercises

I. *Form new words using the component* **proof** *and translate them into Russian:*

M o d e l : water → **waterproof**

shock, bullet, sound, splinter, rust, fire, damp

II. *State the function of the italicised words and translate the sentences into Russian:*

1. Production capacities have been increased by more than 2.5 times considerably decreasing building *costs*. 2. This new modern structure *costs* a large sum of money. 3. The *cost* of the heating plant is considerably reduced.

III. *Make up as many questions as you can using the words* **when, what, who, where** *and* **why.**

M o d e l : **Where** was the first reinforced concrete skyscraper in the world built?

TEXT 15D. RECENT RESULTS IN FRENCH RESEARCH ON REINFORCED EARTH

In not more than 60 words write a review of the following text.

Reinforced earth, invented in 1966 by the French engineer Vidal, is a material which has been used frequently in the civil engineering field in recent years. It is a composite material, a combination of earth and reinforcements, the latter generally consisting of metal strips arranged horizontally and able to withstand high tensile stresses.

The principle of reinforced earth is analogous to that of reinforced concrete; it is an economical means of improving the mechanical properties of the basic material, earth, by reinforcing it in the directions in which it is subject to the greatest stresses. The essential phenomenon in reinforced earth is the friction between the earth and the reinforcements.

Reinforced earth has been mainly used for the construction of retaining structures and foundation rafts. The influence of the fine fraction of the fill on the friction between earth and reinforcements has been studied in laboratory tests on samples of sand and powdered clay mixtures.

Exercises

I. *Analyse the paragraphs from the point of the passage logical division. Divide the passage into logical units (an introduction, principal part, conclusion).*

II. *Suggest titles for each logical unit so that you have a detailed plan of each passage.*

III. *Render the following in English and discuss the main points:*

В настоящее время железобетон нашел широкое применение во всех областях строительства и стал основным строительным материалом. Из железобетона возводят промышленные сооружения, различные гражданские здания и жилые дома. Железобетон широко применяют в гидротехническом строительстве при постройке плотин,

шлюзов, доков, набережных. Он является незаменимым материалом при строительстве подземных тоннелей и других сооружений, а также при горных разработках для крепления шахт. Железобетон используют при строительстве тепловых и атомных электростанций, аэродромов, шоссейных дорог, мостов и т. д.

На железобетонные конструкции расходуют примерно в два раза меньше стали, чем на металлические. В то же время железобетонные конструкции более огнестойки и долговечны.

Применение железобетона в строительстве дает возможность экономить сотни тысяч тонн стали, поэтому замена металла железобетоном (там, где это экономически целесообразно) имеет большое народнохозяйственное значение.

15E. DIALOGUES

Repeat the tape-recorded dialogues after the speakers. Memorize them and then perform the conversation in pairs:

Dialogue 1

A.: Why isn't ordinary brick always satisfactory in building practice?
B.: Because of its high volume weight and high thermal conductivity.
A.: What other kinds of bricks are there?
B.: Don't you know? They are light-weight bricks, hollow or porous bricks.
A.: Do light-weight bricks differ from ordinary clay bricks?
B.: Of course, they do! They have a lower volume weight and lower thermal conductivity.
A.: So that means that they are more economical than ordinary bricks.
B.: Yes, they are far more economical than ordinary bricks!

Dialogue 2

A.: What two kinds of reinforced concrete do you know?
B.: Concrete with ordinary reinforcement and with prestressed reinforcement.
A.: How are ordinary concrete structures reinforced?
B.: They are reinforced by introducing steel rods in stretched zones of concrete elements.
A.: What are reinforced concrete structures and elements widely used for?
B.: They are widely used for residential houses and industrial buildings.

Exercise. *Write a summary of the following in English:*

Одним из наиболее древних строительных материалов является камень. Каменные конструкции просты в изготовлении, обладают долговечностью и огнестойкостью. Для сооружения каменных конструкций применяются искусственные и природные камни.

Природные камни тяжелых пород — известняки, песчаники (limestones, sandstones), граниты — используют для облицовки стен, возведения фундаментов. Природные камни легких пород — известняк-

ракушечник, туф (tufa) в южных районах СССР используют для возведения стен.

К искусственным камням относят кирпич различных видов, камни из бетона.

REVIEW 1. *Translate the text at sight and then render it in English:*

Concrete in the Oceans

A compressive review of the symposium on Concrete Sea Structures was held in September.

Papers covering a whole range of concrete marine structures, such as barges, oil storage tanks, giant floating docks, and the related problems of prestressing at sea, underwater placement of situ concrete and foundation techniques, new materials of ferrocement and polymer concrete were widely presented at the symposium.

REVIEW 2. *Read the text. Point out in English in written form what main themes are dwelt upon:*

Sand Concrete

For many, many years nature has been destroying stone, changing it into sand. Now man is learning to do the opposite: he is using sand and cement to create materials which could compete with stone in strength and beauty.

At first the idea of making concrete by using sand was completely rejected. It is common knowledge that concrete is made from gravel and cement, while a mixture of sand and cement is considered useful only to bind bricks. This idea has gripped the attention and minds of scientists and engineers to such an extent that it is no easy task to cast doubt upon this universally accepted truth.

"Sand" concrete is made by putting the matrix under vibration which almost completely eliminates its weak points. Sand concrete has now become almost twice as strong as ordinary concrete with a course aggregate, and much cheaper as well. At present several varieties of sand concrete have been developed.

Exercise. *What is the English for:*

1. песчаный бетон; 2. разрушать; 3. прочность и красота; 4. раствор; 5. полностью отвергать; 6. крупный заполнитель; 7. разновидности песчаных бетонов; 8. обычный бетон; 9. гравий; 10. скреплять (связывать) кирпичи

REVIEW 3. *Translate the following text in written form:*

Huge Block of Flats

Anyone near the Dynamo Stadium in Leningradsky Prospect will see a very long block of flats. It stretches more than 250 metres along the sidewalk. It is 12 stories high and has in-built balconies.

There are 525 flats in the block which range from 2 to 4 rooms. It is one of the biggest large-panel block of flats in Moscow. It has 11,000 square metres of living floor space. The first two stories house a bookshop, a youth café, a rest-room, a library, and the District Palace of Marriages. Besides all the usual comforts the people enjoy other innovations: on the flat roof there is a hothouse, a gymnasium and a room for table tennis. There are many such buildings in Moscow — they are built in the new districts. It takes less than a year to complete a large block of flats of this type.

REVIEW 4. *Listen to the tape-recorded text. Put the words given in bold type into Past and Future:*

Dead and Live Loads. In designing a beam or column for a given position in a structure, the first step **is to estimate** the greatest load it may be required to support. The total load **is composed** of the dead load, which **comprises** the materials of construction (such as floor materials, partitions, columns, and walls), and the live load, or that load due to human occupancy, furniture, equipment, stored materials, snow, and movable partitions. The live load to be used in computations depends upon the use or occupancy of the building. Building codes of cities **differ in** their requirements for minimum live loads.

In certain classes of buildings, office buildings for example, **there is** always a possibility of the relocation of partitions. A general practice among designers **is to add** 15 to 20 psf for movable partitions in tabulating the floor loads.

REVIEW 5. *Read the dialogue in pairs and then discuss it:*

A.: Do you know that the Soviet Union holds the first place in the world for the scale of housing construction?

B.: There's no doubt about it! New apartment houses are built by a conveyor-mechanised method of sections and big units prepared by factories, aren't they?

A.: Right you are! Nowadays houses are being built in weeks with new factory-type methods.

B.: That's true. A great percentage of the houses are constructed by housebuilding plants.

A.: They are, yes. Over 90 per cent of the housing is built according to standard designs.

B.: And you know, thanks to these methods houses are produced with better insulation, better weatherproofing inside and outside surfaces and a 100 per cent increase in central heating, and a 200 per cent in the number of baths and showers.

REVIEW 6. *Give the following dialogue a suitable title:*

A.: Prefabrication offers engineers considerable savings of time and money during construction, don't you think so?

B.: Oh, naturally it does! Prefabrication is a great thing.

A.: At present erection is reduced to on-site assembly of ready-made parts. That's very convenient, isn't it?

B.: You are quite right. Multistorey blocks of flats are assembled from large panels forming whole-room walls.

A.: Whole-room walls, you say? Do you know that throughout the whole country bathrooms are being prefabricated, complete with walls, floor, ceiling, door, bathtub, wash-basin and piping?

B.: Yes, I do. I've read something about it. I also know that prefabrication makes possible to speed up housing construction to a great degree. You agree with me, don't you?

A.: I certainly do. Up-to-date construction requires the use of new building methods and new building materials.

B.: And the use of the new building materials and new building methods help to speed up construction work and decrease its cost.

UNIT 16. BUILT-IN COMPONENTS

Grammar: Participle Constructions (§ 42). Adverbial Modifiers (§ 3). Conditional Sentences (§ 39).

TEXT 16A. BUILT-IN FURNITURE

Listen to the tape-recorded text and then read it out loud. Pay special attention to all the new words and word-combinations:

Built-in components form a permanent, complete and integral part of the internal structure of a building. Therefore they are considered at the planning stage so as to be directly related in size and shape to the design and purpose of each room. They remain fixed units and are left behind as part of the structure if the ownership of the dwelling changes. Movable furniture, as we know, is usually taken away.

Built-in furniture, as a rule, always saves space[1] and materials. It is considered to be a valuable asset in small dwellings. Thus, a built-in wardrobe, planned to fit in where convenient, requires less space than a movable one of similar capacity. This does not affect its efficiency. It has the advantage of being fitted into an awkward corner[2], utilizing space which might otherwise have been wasted.

Built-in furniture, especially the storage type, has always been preferred by many. But the tendency towards smaller dwellings has resulted in economy of space being achieved wherever possible. This has had an important effect on the development and use of built-in furniture.

Open planning, which has now been generally adopted, enables one room to serve the purposes of several. The most practical method of defining the various areas are built-in units. Living and dining areas, for instance, can be separated by a low cupboard arrangement, designed as a bookcase and writing desk on one side, and a sideboard on the other.

Built-in furniture can also be used to take the place of dividing walls, such as built-in wardrobes backing on to each other[3] and separating two bedrooms.

Notes

1. **to save space** — экономить площадь
2. **an awkward corner** — неудобный угол
3. **backing on to each other** — задними стенками друг к другу

Exercises

I. *Give as many words as you can of the same stem and then translate them into Russian:*

advantage, to move, to consider, owner, to dwell, to develop, to utilize, to define, possible, to arrange, to divide, part

II. *Pick a) synonyms, b) antonyms out of the following list of words and translate them into Russian:*

a) dimension, form, usually, purpose, size, same, aim, shape, use, define, low, similar, utilize, commonly, high, determine;
b) external, usually, high, internal, low, convenient, unusually, inconvenient

III. *State the function of the words in bold type in the following sentences and translate the sentences into Russian:*

1. Concrete must be thoroughly worked into the **forms** to fill them entirely and the reinforcement should be tied together so that it **forms** a stable framework. 2. A variety of metal **forms** for concreting are available. 3. As clay **forms** the soil in many areas, it has been used for the making of bricks. 4. Structural walls are space enclosing elements which **form** rooms, or a collection of rooms, in a building; thus their **form** and dimensions must first be determined by the requirements of the plan.

IV. *Translate the following sentences into Russian paying attention to the meaning of the word* **one**:

1. The nature of the site of a building is **one** of the most important factors in architectural design. 2. The question of selection of site is **one** with which the architect is often faced. 3. Any building today is the product not of **one** craft but of many crafts which are all interdependent **one** of the other. 4. In designing a building **one** should take care that most comfortable living conditions are created.

V. *Translate into English using the words of the text:*

Встроенная мебель экономит место и материалы. Это особенно важно в небольших квартирах. В однокомнатных квартирах, в кухнях, встроенная мебель имеет много преимуществ: одна комната может нести функции нескольких. Встроенные элементы могут разделить одну комнату на несколько частей. Так, встроенный книжный шкаф может отделить спальню от жилой комнаты, буфет — столовую от спальни и т. д. В кухне встроенные шкафы для хранения продуктов так же, как и встроенные мойки и холодильники очень удобны.

VI. *Analyse the following sentences and translate them into Russian:*

1. Providing a considerable saving of space and materials, built-in furniture is preferred by many. 2. Built-in furniture being a very important element of modern construction is clearly seen from its being a "space saver" in the small home development programme. 3. The built-in units being widely used in our modern houses, save space and materials. 4. The built-in units being widely used in our modern houses, prove their advantage over conventional furniture.

VII. *Answer the following questions:*

1. At what stage of design should built-in components be considered? 2. What is the purpose of built-in furniture? 3. Built-in furniture is usually fitted into an awkward corner or recess, isn't it? 4. How can a room be divided by built-in units? 5. What is the idea of open planning?

TEXT 16B. BUILT-IN FURNITURE SAVES SPACE

Read the following text and retell it:

At present, most new houses are constructed with built-in furniture. It saves much space, and is usually not so expensive as buying separate pieces of furniture.

In one-room apartments with only a living room and a kitchen it is convenient to use built-in units which enable one room to serve the purposes of several. The living room can be easily combined with the bedroom. Between the two parts of the room a wardrobe can be built in. One side of it can serve as a wardrobe and the other as a bookcase or a built-in writing desk. It is quite possible to plan a dining recess in the kitchen.

Furthermore, at present many kitchens and bathrooms are being built as complete units and in some cases the finished room is made entirely off the site and is just placed into position by crane.

16C. DIALOGUES

Listen to the tape-recorded dialogues before reading them in pairs. Point out what you consider to be new and important information for you.

Dialogue 1

A.: There was a time when the height of a building was limited to four and five storeys, wasn't there?
B.: You are quite right! There was such a time, yes.
A.: Do you happen to know the reason why that was so?
B.: It was so because the walls of a building had to carry the whole framework and the roof of a building.
A.: At present the frame carries the walls, doesn't it?
B.: Sure, it does. A structural steel framework has completely done away with the need for thick masonry walls.

A.: It looks as if the primary function of walls in general has been changed.
B.: Definitely so. Builders of high-rise structures rest the walls of the structure independently upon a so-called skeleton.
A.: Do you think that the walls of such a building could be built from the roof downward?
B.: Why not? They no longer support the structure. Therefore, if necessary, the walls could be built downward.
A.: So that means that walls no longer support the structure but only enclose it.
B.: Right! They merely enclose it. The walls are, so to say, no more than curtains.

Dialogue 2

A.: Can you explain what "aluminium steel" is?
B.: "Aluminium steel", you say? I've read something about it, yes.
A.: Is it used in making the skeleton of a tall building?
B.: It is, yes! "Aluminium steel" is smooth and close grained and has a high tensile strength.
A.: Do you think it is a comparatively cheap building material?
B.: It goes without saying that it is!
A.: Isn't it a bit too heavy as a building material?
B.: Oh, no! Indeed no! As a building material it is light and strong.
A.: Did the first skeleton constructions present the builders with many engineering problems?
B.: Of course, they did! They presented them with many engineering problems.
A.: I'm sure some of these problems were connected with the new type of foundations that had to be built.
B.: Not only foundations, but a lot of other things.
A.: They were all solved years ago, weren't they?
B.: Yes, they were successfully solved years ago.

UNIT 17. FORCES ACTING UPON A BODY

| **Grammar:** Subordinate Clauses (§ 3). |

TEXT 17A. DEFORMATION

Render the following in Russian:

Whenever a force acts upon a body, there is an accompanying change in shape or size of the body. This is called deformation. In designing structures, it is often necessary that we know what the deformation in certain members will be. A floor joist, for instance, may deflect to such an extent that the floor will vibrate or the plastered ceiling below may crack. For the usual cases we can readily determine what the deformation will be.

Tension. When a force acts upon a body in such a manner that the body tends to lengthen or pull apart, the force is called tensile.

Compression. When the force acting upon a body has a tendency to shorten it, the force is called compressive and the stresses within the member are compressive stresses. A typical example of compression is a column having a load on its upper end.

Shear. A shearing stress occurs when we have two forces acting on a body in opposite directions but not in the same line. Forces acting as a pair of scissors, tending to cut a body, is an illustration.

Bending. The fibers in the upper part of the beam are in compression, and those in the lower part are in tension. These stresses are not equally distributed over the cross section.

Hooke's Law. In the seventeenth century Robert Hooke, a mathematician and physicist, developed the theory that "deformations are directly proportional to stresses". In other words, if a force produces a certain deformation, twice the force will produce twice the amount of deformation.

Elastic Limit. The elastic limit may be defined as the unit stress beyond which the deformations increase in a faster ratio than the applied loads. If the unit stress is greater than the elastic limit and the load is removed, we will find that the bar has permanently increased its length. This permanent deformation is called the permanent set. It is found during tests that some materials, steel and wrought iron, for instance, show increases in deformation without any increase in stress; the unit stress at which this deformation occurs is called the yield point.

Exercises

I. *Answer the questions:*

1. What is called deformation? 2. In designing structures, is it necessary that we know what the deformation in certain members will be? 3. What usually happens when a floor joist deflects?

II. *Complete the sentences:*

1. Whenever a force acts upon a body, ... 2. In designing structures, it is often necessary to ... 3. If a floor joist deflects, ...

III. *Choose a synonym to each of the four words given below:*

1. **shape** *n* (outer form, smooth, pressure); 2. **change** *v* (to make different, to enlarge, to make less); 3. **plaster** *n* (long, flat piece of timber; mixture of flour and water; soft mixture of lime, sand, water, etc.); 4. **force** *n* (front of a building, physical power, long, narrow passage)

IV. *Answer the questions:*

1. Does "tense" mean "tightly stretched"? 2. Does "tension" mean "the state of being tense"? 3. What happens when a force acts upon a body?

V. *Complete the sentences:*

1. The wire lengthened because ... 2. The body was pulled apart because ... 3. It is necessary to measure the tensile strength of ...

VI. *Choose a synonym to each of the four words given below:*

1. **lengthen** *v* (to make wider, to make shorter, to make longer); 2. **act** *v* (to finish doing something, to do something, to begin doing something); 3. **body** *n* (main part of a structure, flat piece of wood, solid structure of wood); 4. **pull** *v* (to cause to move away, to draw towards or after one, to tear or separate)

VII. *Answer the questions:*

1. What kind of a force is called a compressive force? 2. What are the stresses within such a body called? 3. Is a column having a load on its upper end a typical example of compression?

VIII. *Complete the sentences:*

1. When a great force acts upon a body ... 2. The cotton was compressed into bales because ... 3. When we get something into a smaller space, we say that we ...

IX. *Choose a synonym to each of the four words given below:*

1. **compress** *v* (to put together, to press together, to bring to an end); 2. **shorten** *v* (to make shorter, to make narrower, to make thinner); 3. **column** *n* (tall, upright pillar; bell tower; apparatus for heating water); 4. **load** *n* (wooden panel, iron plate, something heavy)

X. *Answer the questions:*

1. When does a shearing stress occur? 2. When the fibers in the upper part of the beam are in compression, what are those in the lower part? 3. What theory did Robert Hooke develop? 4. How may the elastic limit be defined?

XI. *Complete the sentences:*

1. A shearing stress occurs when ... 2. When the fibers in the upper part of a beam are in compression, those in the lower part are in ... 3. Robert Hooke developed his theory in the years ... 4. If the unit stress is greater than the elastic limit ...

XII. *Choose the correct meaning of the words given below:*

1. **opposite** *adj* (facing, out of order, active); 2. **scissors** *n* (instrument for gripping things, cutting instrument, saw for cutting through metal); 3. **distribute** *v* (to recognize, to understand, to spread out); 4. **produce** *v* (to make, to get, to build); 5. **increase** *v* (to make simpler, to make smaller in size, to make greater in size); 6. **century** *n* (10 years, 100 years, 1000 years); 7. **occur** *v* (to get rid of, to happen, to divide); 8. **permanent** *adj* (going on for a long time, going on for a short time; going on forever); 9. **wrought iron** (чугун, железная руда, сварочное железо)

XIII. *Answer the following questions:*

1. What occurs if a load of sufficient magnitude is applied to a test specimen? 2. What is the unit stress within the bar called just prior to its breaking?

XIV. *Complete the sentences:*

1. Rupture occurs ... 2. By "ultimate strength" we mean ...

XV. *Choose a synonym to each of the three words given below:*

1) **sufficient** *adj* (enough, strange, portable); 2) **rupture** *n* (bits of broken stone, breaking apart or bursting, deep, narrow valley); 3) **ultimate** *adj* (first, second, last)

Self-Training Work

TEXT 17B

Read the passages and then express the main idea of each in Russian:

Kinds of Loads. The two types of loads that commonly occur on beams are called concentrated and distributed. A concentrated load is assumed to act at a definite point, such as a column resting on a beam. A distributed load is one that acts over a considerable length of the beam. A concrete slab supported by a beam is an illustration of a distributed load.

Designing Steel Beams. In designing beams, the loads are never known accurately because the size of the beam and consequently its weight are unknown when the computations are begun. One method employed is to estimate the weight due to the beam itself and to check this assumed load with the actual weight of the beam selected as a result of computations.

Design of Steel Columns. In the absence of safe load tables, the design of columns is accomplished by the trial method. Data include the load and the length of the column; the designer selects a trial cross section and, by means of a column formula, computes the allowable load that it will support. If this allowable load is less than the actual load the column will be required to support, the column section assumed is too small and another section is tested in a similar manner.

Grillage Foundations. In order to distribute a column load over the foundation bed, steel grillage is occasionally used instead of a reinforced concrete footing. This usually consists of two layers of beams. The beams are encased in concrete not less than 4 in. thick as a means of protection, and the lower tier rests upon a bed of concrete to distribute the column load to the foundation bed.

Exercises

I. *Answer the questions. Which of these questions are being considered in the text and in which passages?*

1. What is a beam called that rests upon a support at each end? 2. What is a beam called that is supported at only one end? 3. What is a beam called that rests upon two or more supports? 4. What is a beam called that rests upon more than two supports? 5. What kind of a beam is called a fixed beam?

II. *Complete the following sentences:*

1. A simple beam ... 2. A cantilever beam ... 3. An overhanging beam ... 4. A continuous beam ... 5. A fixed beam ...

III. *Choose the correct meaning of the words given below:*

1. **support** *v* (to bear the weight of, to overcome difficulties, to unfasten); 2. **project** *v* (to make ready, to lengthen,to stick out); 3. **continuous** *adj* (hard to understand; going on without break; not the same); 4. **restrain** *v* (to keep under control, to move slowly, to spoil the form of)

IV. *Answer the questions:*

1. What are the two types of loads called that commonly occur on beams? 2. Where is a concentrated load assumed to act? 3. What does a distributed load act over?

V. *Complete the following sentences:*

1. A concentrated load is assumed to ... 2. A distributed load is one that acts ... 3. An illustration of a distributed load is ...

VI. *Choose the correct meaning of the words given below:*

1. **concentrate** *v* (to give permission, to make easy, to bring together at one point); 2. **concrete** *n* (bottom of the sea, building material, top covering of a building); 3. **illustrate** *v* (to explain by examples, pictures, etc.; to set on fire; to give light to); 4. **considerable** *adj* (friendly, of small size, great)

VII. *Answer the questions:*

1. Why are the loads never known accurately in designing beams? 2. By what method is the design of columns accomplished in the absence of safe load tables?

VIII. *Complete the following sentences:*

1. In designing beams, the loads are never known accurately because ... 2. In the absence of safe load tables, the design of columns is accomplished by ...

IX. *Choose the correct meaning of the words given below:*

1. **accurate** *adj* (capable, exact, often repeated); 2. **select** *v* (to choose, to jump, to decide); 3. **require** *v* (to save, to need, to look for); 4. **similar** *adj* (not the same, full of energy, of the same sort)

X. *Answer the questions:*

1. When and for what purpose is steel grillage used? 2. What does steel grillage usually consist of? 3. For what purpose are the beams encased in concrete? 4. Is it usually helpful to use reinforced concrete footing?

XI. *Complete the following sentences:*

1. Steel grillage is occasionally used instead of a reinforced concrete footing in order to ... 2. Steel grillage usually consists of ... 3. The lower tier rests upon a bed of concrete to ...

XII. *Choose the correct meaning of the words given below:*

1. **occasionally** *adj* (now and then, seldom, often); 2. **encase** *v* (to encircle, to cover, to scrape out); 3. **completely** *adv* (partly, wholly, independently)

TEXT 17C. TYPES OF BEAMS

Memorize the terms given in bold type:

A simple beam is a beam that rests upon a support at each end, there being no restraint at the supports. This is the type most commonly in use.

A cantilever beam is a beam that is supported at only one end. A beam projecting from a wall is an example.

An overhanging beam rests upon two or more supports, one or both ends projecting beyond the supports.

A continuous beam is a beam that rests upon more than two supports.

A fixed beam is a beam that is restrained against rotation at an end or ends.

Exercise. *State the form of the predicate and translate the following sentences into Russian:*

The two types of loads that commonly occur on beams are called concentrated and distributed. A concentrated load is assumed to act at a definite point, such as a column resting on a beam. A distributed load is one that acts over a considerable length of the beam. A concrete slab supported by a beam is an illustration of a distributed load. If the distributed load exerts a force of equal magnitude for each unit of length, it is known as a uniformly distributed load.

TEXT 17D. DESIGN OF WELDED JOINTS

Listen to the tape-recorded text and render it either in English or in Russian:

The most economical choice of weld to use for a given condition depends on several factors. It should be borne in mind that members to be connected by welding must be firmly clamped or held rigidly in position during the welding process. In riveting a beam to a column, it is necessary to provide a seat angle as a support to keep the beam in position for riveting the connecting angles. The seat angle is not con-

sidered as adding strength to the connection. Similarly, with welded connections, seat angles are commonly used. The designer must have in mind the actual conditions during erection and must provide for economy and ease in working the welds. Seat angles or similar members used to facilitate erection are shop welded before the material is sent to the site. The welding done during erection is called field welding. The designer in preparing welding details indicates on the drawings which are shop and which are field welds. Some designers consider field welding to be less effective than shop welding and, therefore, reduce the working stress in field welds. Reductions up to 25% are sometimes used. Conventional welding symbols are used to indicate the type, size, and position of the various welds. Only engineers or architects experienced in the design of welded connections should design or supervise welded construction. It is apparent that a wide variety of connections is possible; experience is the best aid in determining the most economical and practical.

Exercise. *Use the following words and word-combinations in sentences of your own:*

design; weld; joint; choice; condition; to depend on; to be borne in mind; member; clamp; rigidly; to be held; rivet; to provide; a seat angle; support; strength; connection; similarly; designer; to facilitate; erection; ease; to indicate; field welding; shop welding; to reduce; to supervise; aid; apparent; to determine

UNIT 18. FOUNDATIONS (I)

TEXT 18A. PILE FOUNDATIONS

In the following text point out the introductory part, the main part and the conclusion:

The durability of a structure depends on how the foundation is built and on the property of the ground.

Prior to the beginning of the last century buildings were put up mostly on stable ground. Bands of stone and baked bricks bound together by lime mortar served as foundations.

Our ancestors could not even imagine on what kind of ground we would build. Towns and cities have appeared in places where there had recently been swamps, on the permafrost ground of the northern regions of the country. Pile foundations are widely used there. They cut through the unstable thickness of the ground and rest upon firm layers.

Piles were also used in ancient times. Peter I widely used piles in building the city. Interestingly, Ivan the Great's bell tower in the Kremlin (about 500 years old) also stands on a peculiar pile foundation. The base is comprised of round, closely bound upright logs from 120 to 180 cm high. In those days there were no mechanisms to drive in piles — that accounts for their being so short. Upon the piles rests a massive stone slab. The piles are submerged in water to protect the wood from destruction.

Ferro-concrete was discovered about 200 years ago. Wooden piles gradually became a thing of the past. They have been replaced by ferro-concrete and metal piles.

During the last few decades pile boring has found wide application. A bore hole is first filled with steel framework, then with concrete, and the pile is ready.

A group of specialists has developed piles without using building materials for the purpose. At the depth of 16—18 m a hole is drilled. A special burner is then inserted. At 1,400°C the earth fuses. It then hardens and becomes a bearing pillar. Several buildings have already been erected on such "piles".

The foundation of the Alma-Ata TV tower is quite original. The tower was built on a small site in the mountains, where force 10 earthquakes can occur. The foundation is a reinforced casing. On it there stands a three-storey building together with a metal tower 360 m high.

Exercises

I. *Find answers in the text to the following questions:*

1. What does the durability of a structure depend on? 2. How were foundations built prior to the beginning of the last century? 3. Can you tell us what kind of foundations are used in the northern regions of our country? 4. Were piles used in ancient times? 5. Do you know anything about the foundation on which Ivan the Great's bell tower in the Kremlin stands? 6. When was ferro-concrete discovered? 7. Pile boring has found wide application, right? 8. Can piles be made without using building materials? 9. Why is the foundation of the Alma-Ata TV tower considered to be quite original?

II. *Find in the text nouns corresponding to the following words and translate them into Russian:*

to apply, to destroy, durable, to burn, wooden, to begin

III. *Find in the text adjectives corresponding to the following words and translate them into Russian:*

to bake, stability, firmness, peculiarity, to shorten, widely

IV. *Find in the text verbs corresponding to the following words and translate them into Russian:*

dependent, service, appearance, useful, binding, protection, discovery, filling, development, drill, hard, erection

V. *Find in the text the antonyms of the following words and translate them into Russian:*

the end, to disappear, stable, young, long, the present, down

VI. *Find in the text the English equivalents of the following words and word-combinations:*

прочность сооружения; до начала прошлого века; устойчивый грунт; ленты из камня и обожженного кирпича; известковый раствор; наши предки; топи; свайные фундаменты; в давние времена; круглые бревна; забивать сваи; огромная каменная плита; погружать; оберегать от разрушения; уйти в прошлое; без применения строительных материалов; горелка; затвердевать; землетрясение; железобетонная коробка; буронабивная свая

TEXT 18B. THE USE OF PYRAMIDAL PILES IN BUILDING

Make up a plan of the following text and retell it according to the plan:

Pyramidal piles are a progressive design of piles used in building. These piles have the shape of an enlarged pyramid; they are rammed into the ground, acute end first. Unlike prismatic piles, pyramidal piles pack the soil along the sides while sinking into it, thus enhancing the mechanical quality of the soil, and subsequently conveying the load of the whole side surface upon the packed basis.

Such distinctive features of the work of prismatic and pyramidal piles in the basis soils ensures the possibility to enhance the bearing capacity of pyramidal piles with respect to prismatic piles by 1.5-2 times.

Pyramidal piles are used in the basis of buildings and constructions for various purposes and designs. They are especially effective when packed soil lies on the upper part of the basis from 3 to 5 m deep, while loose soil can lie underneath.

In this case pyramidal piles must work as single piles. When pyramidal piles are arranged in groups and joined by a low foundation raft, the depth of the loose soil should be taken into consideration as well as the number of piles in the group. If the basis is made up of packed soil along the whole depth, the number of piles in the group is not limited.

The structural design of pyramidal piles is carried out in accordance with the deformations, proceeding from the equality of the work of external and internal forces with due regard for obligatory requirements. The volume of the stabilization zone should not exceed the volume of the consolidation zone while conveying the load to the pile.

Exercise. *Render the following sentences in English:*

1. Пирамидальные сваи имеют форму усеченной пирамиды, забиваемые в грунт острым концом. 2. Пирамидальные сваи при погружении в грунт производят уплотнение грунта вдоль боковой поверхности, повышая тем самым механические свойства грунта. 3. Отличительные особенности работы пирамидальных свай в грунтах основания обеспечивают возможность повышения несущей способности пирамидальных свай по отношению к призматическим в 1,5-2 раза. 4. Пирамидальные сваи применяются в основании зданий и сооружений различного назначения и конструкции. 5. Особенно эффективно их применять в том случае, когда в верхней части основания на глубине 3-5 м залегают плотные грунты. 6. При кустовом расположении пира-

мидальных свай, объединенных низким ростверком, учитывается глубина расположения слабого слоя и количество свай в кусте. 7. Если же основание сложено на всю глубину плотными грунтами, то количество свай в кусте не ограничивается.

TEXT 18C. HIGH-QUALITY HOUSING

Listen to the tape-recorded text and retell it in Russian:

A comparison between typical pre-fabricated ferro-concrete structures: columns, beams, floor and ceiling slabs, etc., employed in the Soviet Union and abroad shows that we use 20—25 per cent less concrete and steel than the builders in West Germany, Britain, the United States and other industrialized countries. The search[1] for more rational ways of building and of improving designs for houses and other structures undertaken by research and design bureaus[2] in the Soviet Union, has resulted in these savings[3].

New pre-fab parts with improved heat insulation made of mineral cotton and foam plastics[4] are being widely used in construction. The use of such materials makes it possible to reduce the weight of buildings by three to four times. There has also been a considerable rise in the output of components made from light and extra-strong concrete[5].

We have also started to build cheap and light structures out of steel, aluminium, plywood[6], asbesto-cement and plastics. The use of these and other new products and processes results in an annual[7] saving of thousands of tons of ferrous metals and over a million tons of cement.

Notes

1. **search** — поиск
2. **undertaken by research and design bureaus** — которыми занимаются проектные организации
3. **saving** — экономия вышеуказанных материалов
4. **foam plastics** — пенопласт
5. **extra-strong concrete** — сверхпрочный бетон
6. **plywood** — фанера
7. **annual** — ежегодный

TEXT 18D. GRILLAGE FOUNDATION

Look up the meaning of the following words and word-combinations in the dictionary and then read the text:

grillage, foundation bed, reinforced concrete footing, as a means of protection, tier, to be encased, to resist, bending, shearing, bond, stress

In order to distribute a column load over the foundation bed, steel grillage is occasionally used instead of a reinforced concrete footing. This usually consists of two layers of beams. The beams are encased in concrete not less than 4 in. thick as a means of protection, and the lower

tier rests upon a bed of concrete to distribute the column load to the foundation bed. Since the grillage beams must be completely encased in concrete, the bearing areas of the grillage foundation and a reinforced concrete footing are practically the same. Therefore, it is usually expedient to use the reinforced concrete footing. In this case the concrete resists bending, shearing, and bond stresses instead of merely being a protecting material for the steel grillage beams.

UNIT 19. FOUNDATIONS (II)

TEXT 19A. THE FOUNDATION OF THE OSTANKINO TV TOWER

Repeat the tape-recorded text after the speaker. Point out what you consider to be new and important information for you:

The reinforced concrete tower of the TV centre in Moscow was built after the design of Nikolai Nikitin. The tower is 535 m high.

The 32-thousand-ton tower rests upon a monolithic hooped reinforced concrete foundation[1] 9.5 m wide, 3 m high and 74 m in diameter. In the 10-angled reinforced concrete band of the foundation[2] prestressing was created by means of a system of stressed hooping[3].

The depth of the foundation is 4.65 m. It is assumed that it will settle from 3 to 3.5 cm. The stability[4] of the tower has a sixfold margin of safety[5].

The 8th International Soil Mechanics and Foundations Congress recognized N. Nikitin's idea of building the foundation at the depth of 4.65 m to be a brilliant one.

While the foundation was being built, specialists expressed their concern that the depth was insufficient for such a high tower. Relying on the experience of putting up high-rise structures, specialists suggested a hypothesis stressing the necessity to plant the base of the TV tower on supports resting upon a rock[6].

Scientists were of the opinion that because of the insignificant depth of the foundation, ground work in its vicinity (the building of collectors, tunnels, metro lines etc.) could result in the loss of earth from under the foundation[7]. The specialists who shared this opinion recommended a 40-metre foundation. But N. Nikitin turned down that opinion[8] and proved that his designed tower could stand even without having a foundation. Nikitin's calculations have been confirmed by life[9].

The reinforced concrete support of the whole structure is a conical casing[10] which rests upon bankets[11] of the foundation with 10 reinforced concrete "legs"[12].

The diameter of the lower base of the casing is 60.6 m, being 18 m at the height of 63 m. The upper part of the reinforced concrete bole[13], beginning at the height of 321 m, is made in the form of a cylinder with an exterior diameter of 8.1 m. The base walls of the tower are 500 mm thick.

In the centre of the conical base, resting upon an independent foundation (a round reinforced concrete slab 12 m in diameter and 1 m thick),

a reinforced concrete "pocket"[14] 63 m high and 7.5 m in diameter was erected through which run[15] means of communication[16]. The beam ends of 15 interstorey floors[17] rest upon the "pockets". The construction of separate foundations for the two independent structures — the tower and the "pockets" — allows to exert upon the ground different pressure when uneven settling[18] occurs[19].

Notes

1. **monolithic hooped reinforced concrete foundation** — монолитный кольцевой железобетонный фундамент
2. **a 10-angled reinforced concrete band of the foundation** — десятиугольная железобетонная лента фундамента
3. **a system of stressed hooping** — система кольцевой напряженной арматуры
4. **stability** — устойчивость
5. **a sixfold margin of safety** — шестикратный запас на опрокидывание
6. **to rest upon a rock** — опираться на скалу
7. **to result in the loss of earth from under the foundation** — приводить к выходу грунта из-под фундамента
8. **to turn down an opinion** — отвергать мнение
9. **to be confirmed by life** — быть подтвержденным жизнью
10. **a conical casing** — коническая оболочка
11. **banket (banquette)** — насыпь, берма
12. **a leg** — опора, стойка
13. **a reinforced concrete bole** — железобетонный ствол
14. **pocket** — гнездо, «стакан»
15. **to run** — *зд.:* проходить
16. **means of communication** — средства коммуникации
17. **interstorey floors** — междуэтажные перекрытия
18. **uneven settling** — неравномерная осадка
19. **to occur** — происходить, иметь место

TEXT 19B. AN OUTSTANDING SOVIET BUILDER

Listen to the tape-recorded text given below and then do the following: a) enumerate all the buildings created by N. V. Nikitin; b) say a few words about each of those buildings.

Nikolai Vasilyevich Nikitin was an outstanding Soviet scientist, Merited Builder of the RSFSR, a Lenin and USSR State Prize winner, Doctor of Technical Sciences.

He was an outstanding engineer and a creator of new building constructions, a recognized authority in the field of high-rise building, a talented organizer of constructional designing, the author of world reknown unique structures.

N. V. Nikitin was the creator of such structures as Moscow University, the Palace of Culture and Sciences in Warsaw, the V. I. Lenin Central Stadium in Moscow, the first high-rise building in Tashkent,

the V. I. Lenin Memorial in Ulyanovsk, the Volgograd Monument to the Motherland, and many others.

The above-mentioned structures have received recognition far beyond the borders of this country.

The Ostankino TV tower in Moscow is considered to be the acme of N. V. Nikitin's creative work. Extremely complicated technical problems were solved while putting up this unique structure.

N. V. Nikitin carried out extensive scientific work as well. He was a recognized authority in the field of theoretical calculation of reinforced concrete constructions, the author of 70 printed works and 20 inventions.

For his outstanding creative achievements the honorary title of the Lenin and USSR State Prize Laureate were conferred upon N. V. Nikitin.

Exercise. *Write a summary in English:*

Фундамент Останкинской телебашни

1. Железобетонная башня телевизионного центра в Москве создана по проекту архитектора и инженера Николая Никитина.

2. Сооружение имеет высоту 535 метров.

Башня, вес которой более 32 тысяч тонн, возведена на монолитном кольцевом железобетонном фундаменте шириной 9,5 метров, высотой 3 метра и диаметром 74 метра. В десятиугольной железобетонной ленте фундамента с помощью системы кольцевой напряженной арматуры создано предварительное напряжение.

Фундамент заложен в грунт на глубину 4,65 метра. Предполагается, что он осядет на 3-3,5 сантиметра. Устойчивость башни на опрокидывание имеет шестикратный запас.

3. На VIII Международном конгрессе по механике грунтов и фундаментам идея Н. Никитина о заложении фундамента в грунт на глубину 4,65 метра, представляющего от высоты башни лишь 0,9%, была признана блестящей.

4. При закладке фундамента специалисты высказали предположение о том, что такая глубина является недостаточной.

5. Исходя из опыта возведения высотных сооружений, специалисты выдвинули гипотезу о необходимости основания телебашни на глубоких опорах, опирающихся на скалу.

Ученые придерживались той точки зрения, что из-за мелкого заложения выполнение поблизости каких-либо подземных работ (прокладка коллекторов, теплофикационных тоннелей, постройка линий метрополитена и т. п.) может привести к выходу грунта из-под фундамента. Специалисты, разделявшие это мнение, начали просчитывать сорокаметровый фундамент.

6. Но Н. Никитин отверг это мнение и доказал, что спроектированная им башня может стоять даже без фундамента.

7. Расчеты Никитина были подтверждены жизнью.

8. Железобетонная опора всего сооружения — это тонкостенная коническая оболочка, опирающаяся десятью железобетонными «ногами» на банкетки фундамента.

TEXT 19C. PLASTIC DOME HOMES PROVIDE EMERGENCY SHELTER

Render the following in Russian:

Room-sized plastic domes, fabricated on site about an hour each to provide temporary housing, are helping to ease the plight (затруднительное положение) of 90,000 persons left homeless in western Turkey by an earthquake.

Equipment and materials for producing 200 of the iglooshaped polyurethane shells were provided and flown to the region 200 miles west of Ankara.

The dome units, each 16 ft in diameter and 10 ft high, are formed by spraying polyurethane over a mold that is rotated on a turntable. The mold consists of a balloon of polyvinyl chloride-coated textile that is deflated (сплющивается) after the 4-inch-thick shells are formed.

Each unit, weighing about 440 lb, is then hand-lifted from the mold and placed without a foundation. Doors, windows and roof vents are sawed out. The process produces 15 domes per day.

The truck-mounted production facility includes a 2.5-ton foam-producing machine, a collapsible turntable and mold, and a supply of the polyurethane compound.

The shells have a life expectancy of 10 years. They may be painted or left unfinished. Occupants, often 8 to 10 per unit, moved in almost as rapidly as the domes could be produced.

Refinement of the concept to produce substantially larger structures would entail moving the foam machines around stationary molds. The emergency structures are an offshoot of on-site spraying of polyurethane as insulation for building roofs.

Exercise. *Translate the sentences into English·*

1. Землетрясения, приносящие разрушения, напоминают нам, как невелика наша планета и как хрупко людское жилье. 2. Ученые нашей страны разработали рекомендации по сейсмостойкому строительству.

19D. DIALOGUES

Read the dialogues in pairs:

Dialogue 1

A.: Do you know who designed the tower of the Moscow TV centre?
B.: Sure, I do! The architect and builder Nikitin designed it.
A.: By the way, what is the height of the tower?
B.: The tower is 535 m high and is built of reinforced concrete.
A.: It must weigh a couple of thousand tons, I'm sure.
B.: It weighs 32 thousand tons, to be exact!

Dialogue 2

A.: You've just said that the tower weighs 32 thousand tons. Right?
B.: Quite right! 32 thousand tons.
A.: What can you tell me about the foundation?
B.: It is a monolithic hooped reinforced concrete foundation.
A.: How wide is it? Do you know?
B.: It is 9.5 m wide, 3 m high and 74 m in diameter.

Dialogue 3

A.: What is the depth of the foundation of the tower?
B.: It's not very deep — only 4.65 m.
A.: Aren't you mistaken?
B.: No, I'm not. That was Nikitin's brilliant idea.
A.: Won't the TV tower topple over some day?
B.: No, it won't because it has a sixfold margin of safety.

Dialogue 4

A.: What does the conical casing of the tower rest upon?
B.: It rests upon bankets of the foundation.
A.: How many reinforced concrete "legs" are there?
B.: There are 10 of them, as far as I know.
A.: What is the diameter of the lower base of the casing?
B.: It is 60.6 m, but at the height of 63 m it is 18 m.

Dialogue 5

A.: There's a reinforced concrete "pocket" in the centre of the conical base, isn't there?
B.: You are quite right; there is such a "pocket".
A.: How high is the "pocket"?
B.: Just a bit over 60 metres.
A.: And how many metres in diameter is it?
B.: It is seven and a half metres in diameter.

UNIT 20. THE UNITED STATES OF AMERICA

TEXT 20A. FROM THE HISTORY OF THE USA

Study the text and then make a report on the USA adding whatever information you find appropriate.

The United States of today have developed from the British colonial settlements on the Atlantic coast of North America. In the 17th and 18th centuries these colonies supplied England with raw materials which she badly needed for her industry. It goes without saying that England exploited her colonies harshly. Everything was done to prevent their industrial development. Their trade development was hampered too. When the colonists could stand this no longer, they rebelled against England. A long struggle followed, and in 1783 the colonies succeeded in winning their independence.

In those days the United States occupied only a narrow strip of land along the coast of the Atlantic Ocean. Gradually the territory grew, and by 1853 it extended to the Pacific Ocean.

The contradictions between the capitalist North and the slaveowning South led to the Civil War of 1861-1865. In this war the South was defeated, and the slaves were freed. As a result of this, the capitalist system of economy began to develop rapidly all over the territory of the United States.

In size, the US is not the biggest country. It ranks fourth among the nations after the Soviet Union, Canada and China. It also ranks fourth in population after China, India and the Soviet Union.

The USA is a federal bourgeois republic. It consists of 50 states. The capital Washington is situated in the District of Columbia. All the political power in the US belongs to monopoly capitalists. The government is divided into three branches: legislative (the US Congress), executive (the President and his Administration) and judicial (the US Supreme Court). The Congress is made up mainly of representatives of big business: bankers, industrialists and their lawyers. Workers and poor farmers are not represented at all.

Exercises

I. *Answer the following questions:*

1. What did the North American colonies supply England with? 2. Why did these colonies rebel against England? 3. When did the colonies succeed in winning their independence? 4. What led to the Civil War of 1861-1865? 5. Is the US the biggest country in size? 6. Of how many states does the US consist? 7. To whom does all the political power in the US belong?

II. *Give the three forms of all the irregular verbs given below:*

to have, to be, to make, to find, to build, to think, to go.

III. *Translate the following word-combinations:*

well-constructed, well-advised, well-appointed, well-balanced, well-conducted, well-connected, well-disposed, well-informed, well-knit, well-marked, well-intentioned, well-read, well-spoken, well-timed, well-tried, well-worn

IV. *Use the following compounds in short sentences:*

M o d e l : Our garden is **overlooked** from this window.

overlook, overthrow, overwork, overturn, overtake, overstay, oversleep, overnight, overpower, overleap, overhear, overdo

V. *Choose the correct meaning of each word given below.*

M o d e l : to overlook=to pay no attention to

to overlook	to continue to exist
to reveal	to pay no attention to

a century	an open square
a layout	a place smaller than a town
rectangular	shaped like an ellipse
a plaza	an arrangement
oval-shaped	having four sides
to construct	to cause to be seen
to survive	to build
a village	100 years

TEXT 20B

Read the text, give it a title and then speak upon the subject:

About 2,000,000 New Yorkers ride to work in the subways every morning. They are subjected during their trip to fumes, noise, heat and buffeting. The New York subway trains are not so clean and comfortable as they should be.

The subway car has room for 50 sitting and 50 standing holding onto straps and poles. But the train gets so jammed during the rush-hours that people cannot even fall when the train lurches. The subway trains often get stuck between stations. Just as people begin to get desperate it begins to move, and finally reaches the station.

The worker arrives home dead tired and weak. It is a real struggle for a New Yorker to get to his job and then back home by subway. Most of the New Yorkers consider their subway system a disgrace to humanity.

20C. DIALOGUE

Read the dialogue in pairs and then discuss it.

A.: Have you ever been to New York City?
B.: No, I haven't; but my father has.
A.: Is New York a very old city? Do you know?
B.: Properly speaking, it was founded over 300 years ago.
A.: At first the city's development was comparatively slow, wasn't it?
B.: Yes, it was. It became more rapid in the 19th century.
A.: A favourite phrase among Americans is "New York is not America."
B.: That's true. Americans repeat that over and over, especially when speaking to foreigners.
A.: One may find a little of New York in all the cities of the US.
B.: You know, the noise of the street is so great that one must shout to be heard.
A.: I've been told that the inhabitants of the vast slums of New York live in overcrowded quarters.
B.: Quite true, especially the slums of Harlem are the most densely populated.
A.: As far as I know, the houses there are in worse condition than anywhere else.

B.: The downtown section of New York is said to be a solid mass of buildings.
A.: What about trees? Aren't there any trees in that section of New York?
B.: There is hardly a tree there or even a single blade of grass.
A.: Some people say that New York is a city without a past. Is that so?
B.: I think it is. New York holds no place sacred and bows down to no tradition.
A.: Suppose you were asked to describe the spirit of the city in a single word, would you be able to do it?
B.: Summed up in a single word, the spirit of the city may be described as speed!

TEXT 20D. AN OPPONENT OF SLAVERY

Give an oral translation of the text:

The name of Abraham Lincoln is one of the most remarkable in the history of the United States of America.

Lincoln was born in Kentucky in 1809, in the family of a poor farmer. His mother died when he was not yet 10. His father's second wife proved to be a very affectionate stepmother. Little Abe had to walk a long way to get to school and he had no more than one year's schooling in his whole life.

A strong healthy lad, he had to work hard to help his family. As he grew older, he became a great reader. In 1831 Lincoln left home and went to live in New Salem, Illinois, where he worked first in a mill and then in a grocery store. His sound qualities earned him the respect of his fellow-villagers, who soon began to look upon him as their leader.

Lincoln was appointed postmaster of New Salem, but this post gave him very little money, and he had to do all kinds of odd jobs to make both ends meet.

In 1834 he was elected to the state legislative in which he served very successfully for four terms. In 1847 Lincoln was elected to the United States Congress. In 1854 Lincoln was one of the organizers of the new Republican Party which was against slavery. His popularity and fame increased so much that in 1860 he was elected President of the United States.

The southern slave-owners were so indignant at Lincoln's election that shortly after the election the Southern states, one by one, left the Union and formed their own Confederation, thus bringing the threat of civil war. Soon the war began.

Lincoln was a clever statesman and realized fully that the country had to remain united for its two parts were economically dependent on each other. The North was industrial and the South was agricultural.

Unlike the army of the North, the army of the South was well organized and ready for war. Therefore during the first months of the war the North suffered heavy losses. After fierce battles the North won the war and the unity of the country was restored.

On April 14, 1864, while the country was celebrating the victory, Lincoln was shot dead in a theatre by an agent of big slave-owners and bankers.

UNIT 21. WATER AND WATER SUPPLY (I)

21A. DIALOGUES

Read the dialogues in pairs and point out what questions are being considered in them. Choose a suitable title for each dialogue.

Dialogue 1

A.: Water is more essential to a man's life than food, isn't it?
B.: Than's very true. There is no life without water.
A.: The great importance of water was realized by our remote ancestors, right?
B.: Right! That's why their settlements were nearly always situated on the banks of rivers and lakes.
A.: The location of human settlements and the well-being of the people depended on the distance from the source of water.
B.: I fully agree with you! The earlier settlers realized this need.
A.: They surely did! I suppose they took advantage of natural water sources. Don't you think so?
B.: Of course, I do! That's why they established their colonies in close proximity to them.

Dialogue 2

A.: The science of water supply goes back to Ancient Greece, doesn't it?
B.: Quite right, it does! The early Greeks built wonderful systems of aqueducts.
A.: And I've heard that they even made pipes of clay to transport water to their settlements.
B.: Oh, yes! The first pipes of clay were made for that purpose.
A.: By the way, have you seen pictures of the remaining parts of Roman aqueducts?
B.: I have, yes! The remaining parts of Roman aqueducts serve as monuments of engineering skill of ancient times.

Dialogue 3

A.: Not all water is drinkable, is it?
B.: No, not all water is drinkable; not all water is pure.
A.: What did our ancestors do about this?
B : They began to find ways to purify their water.
A.: And whenever they had pure water, they did their best to keep it pure.
B.: They had to do that if they wanted to survive.

A.: In ancient times, when people lived far apart, there was plenty of pure water for all.

B.: But when people began living closer together, waste matter found its way into the sources of water supply.

Self-Training Work

TEXT 21B

Give the following text a suitable title:

Centralised water supply dates back to 2500 BC. Ancient Egypt had complex engineering structures for the purpose. Yet to this day the percentage of the population enjoying centralised water supply on the African continent, and in Asia, too, is very low.

In our country, at the time of the Revolution of 1917, only one-third of the towns had running water laid on, and then, as a rule, only in the central part of the town. In the pre-war period of industrial development running water reached millions of flats all over the country. Water supply systems were built in Kazakhstan, Uzbekistan, Georgia, the Ukraine. But many of the systems and practically all in the western and central parts of European Russia, were destroyed during the war and had to be built anew.

Fresh water shortage was first mentioned soon after the end of the Second World War. The first to feel the stint was Europe. The problem came to many as a complete surprise, something in the nature of an unexpected "catastrophe". This catastrophe, however, should have been foreseen, for it follows logically from the development of human life on our planet and of Man's industrial activity.

In the absence of centralised water supply, a man can do with about 25 litres of water a day for his various personal needs. But in the modern city water consumption per person is much higher. An average of 300 to 500 litres of water is spent daily on household and sanitary needs per one inhabitant of a modern city. You can see this vastly exceeds the necessary minimum of 25 litres. Why the discrepancy (difference)? Not because people leave their taps open. Because water is so abundant no one thinks twice about taking a shower, or a bath, using the washing machine, washing the car, etc. The volume of water consumption is indicative not only of the efficiency of the water supply but also of the population's living standards.

Our need in water is growing. Simultaneously, the globe's population is growing. In the past century the consumption of water by the world's largest cities, such as Paris, London, Berlin and Moscow, has grown 80 to 100 times. During the famous heat wave of 1972 Moscow "drank" almost 5,000,000 cubic metres of water a day. This staggering figure seems to confirm the immediacy of the water dearth problem. In actual fact, however, the problem consists not so much in where to get pure water but in how to deliver it to where people need it.

Exercise. *Translate the following sentences into English:*

1. Вода — важная проблема. 2. Для выплавки тонны стали необходимо 25 тонн воды. Для получения такого же количества синтетического волокна — шесть тонн. 3. Сельское хозяйство без воды существовать не может. 4. Проблема распределения водных ресурсов стала одной из главных в нашей стране. 5. До недавнего времени многие предприятия строились обязательно вблизи озёр или рек. 6. В течение суток производство поглощало сотни тонн чистейшей воды, а выбрасывало отходы. 7. Теперь многие предприятия перешли на замкнутые циклы потребления воды. 8. Главный путь решения проблемы пресной воды — это территориальное перераспределение водных ресурсов.

TEXT 21C

Read and retell the text:

The surface of the earth is 70 per cent water to an average depth of over 4 kilometres. And yet man often does not have enough water. There is no life without water. Man can live without clothes, without shelter and even for some time without food. Without water he soon perishes. But not all water helps him to survive: if it is contaminated, then also he may die before his time. Drinking-water has to be pure. Control of the water's purity is based on a national drinking-water standard. In 1975 a new standard was introduced. The population of many cities is already using water purified by the new technology. But not all problems of water supply have been solved. We know that in the not too distant future our requirements will reach a far greater quantity than we use today, and we must prepare for it now.

TEXT 21D. WATER RESOURCES OF THE USA

Write a précis of the text. Translate the précis into Russian:

The USA is one of the first countries whose developing economy has met with a shortage of pure fresh water. Such conflicting situations have been caused by the exceptionally rapid growth of water consumption and by the constancy of the size of river runoff. The water crisis began to show at the beginning of the 60s. It was then that gigantic projects were born to transport fresh water from Canada and Alaska to the main territory of the USA. At the end of the 60s it became evident that the problem could be solved only by purifying utilized water.

By spending large sums of money on developing gigantic desalination plants it became clear that by channeling the runoff from neighbouring territories and from the ocean an increase in the volume of polluted water would be brought about, which even at present overfills the rivers and lakes of the country.

It is the runoff which can be used without a full regulation of rivers by hydrotechnical installations. It is possible by recycling the same

volume of water, which claims great requirements to the quality of their purification.

The main increase in water consumption takes place in that sphere of national economy, where water is necessary principally for cooling purposes — in industry, especially in thermoenergetics (heat-power engineering).

How can water losses be replenished? It is necessary to note the evergrowing consumption of ground water.

The removal of considerably greater volumes of ground water that are taken at present will not diminish their total storage for a long time. Water supply at the expense of ground water is also convenient to satisfy the every day necessities of the population.

Other reserves that can be used are the waters of the ocean. A wide substitution of fresh water for salt water for cooling purposes is assumed, mainly in heat-power engineering.

Over one quarter of the whole consumption of water will become possible due to the use of seawater. As concerning the abovementioned projects according to which fresh water is to be transported from Canada and Alaska, and the entailed possibility to use the great reserves of hydropower of the western part of the continent, — they have been cancelled.

UNIT 22. WATER AND WATER SUPPLY (II)

Self-Training Work

TEXT 22A

Give a written translation of the text. Put questions to your comrades on the text. Let them give you full answers. Suggest a suitable title for the text.

Today Moscow has a 190-gallon-per-capita-per-day capacity of drinking water. In the years that Moscow has been the Soviet capital, its population has grown from 1.6 million to over 8 million. This called for adding water resources to those furnished by the Moskva River which does not fully satisfy the capital's water needs.

The Volga River gives Moscow a yellowish water with a peculiar taste and smell, because it flows through a boggy and marsh area. Hence the need for extra purification.

A series of experiments led to a decision to ozonize the capital's drinking water. Specialists found ozone not only to be a powerful water purifier, but one that destroys all coloration, leaving the water a pleasant bluish hue, while also removing any and all unpleasant tastes or smells.

The new ozone station has just gone into operation here, and now, each time a Muscovite turns on the faucet, he gets ozonated — that's purified and sterilized — drinking water.

TEXT 22B. PURIFICATION

Make up as many questions as you can:

The processes generally employed in making water safe for water supply include coagulation, filtration, and disinfection. Water from some sources must be treated also for the removal of color, taste, and odor. Coagulation is commonly effected by adding to the water a salt of aluminum (usually aluminum sulphate) or ferric iron. A precipitate forms and causes a clumping of the bacteria and other foreign particles which then settle out during the several hours of sedimentation; in this way 85% or more of the bacteria and suspended particles can be removed. Activated carbon is sometimes added before sedimentation to remove tastes and odors. In the process of filtration the water is allowed to pass through layers of fine sand to remove remaining germs and particles. Chlorine is commonly used to destroy harmful bacteria persisting in a municipal water supply after the other treatments. Chlorine dioxide has more recently been found effective as a destroyer of bacteria as well as a means of removing unwanted tastes and odors. Other means of destroying germs include the use of ozone and of ultraviolet light. Some water supplies are aerated, i.e., exposed to the action of air and sunlight either through sprays or by running over coarse gravel; taste and odor are improved and some germs are destroyed.

22C. DIALOGUES

Read Dialogue 1 in pairs and give it a suitable title:

Dialogue 1

A.: What do you think is the first step in the design of a water-works system?
B.: The first step, you see, is to determine the quantity of water required.
A.: You mean the quantity of water required for the present?
B : No, not only for the present, but for the future as well.
A.: Well, that is the first step. What about the second step?
B.: The second step is to select the source of supply that is most advantageous.
A.: Suppose pumping is necessary, then what?
B.: If pumping is necessary, the design of the pumping stations and the pump and power units must be considered.

Read Dialogue 2 in pairs and then speak about the information presented in the dialogue:

Dialogue 2

A.: Do you think the sea is one of the greatest wonders of the world?
B.: That's very true! Our life, the weather, the atmosphere — all depend upon the sea.
A.: We all know that water is life, isn't that so?
B.: It is, yes. All the life on earth depends on water.

A.: Does the sea influence our climate? Do you know?
B.: Oh, sure it does! It greatly influences our climate.
A.: What about other planets? Do they have seas and oceans?
B.: Well, you see, scientists say that they don't.
A.: Do you fully agree with them?
B.: To tell you frankly, I do. I think they are right.
A : Does water taken up from the seas and oceans by evaporation ever return to the earth?
B.: Of course it does! It returns in the form of rain and snow.
A.: How much water is there in the ocean basins?
B.: About 300 million cubic miles of water! A lot, isn't it?
A.: 300 million cubic miles, you say? So much water?
B.: Right! That's how much water the oceans contain.
A.: So we can say that water covers most of the earth's solid crust.
B.: To be exact, it covers 71 per cent!

UNIT 23. WATER AND WATER SUPPLY (III)

TEXT 23A. WATER SUPPLY OF SALT LAKE CITY

Give an oral translation of the text:

Ever since Salt Lake City was first settled in 1847 the water supply problem has always been of prime importance. The original settlers diverted water from the surrounding mountain streams for irrigation of their crops, and the domestic supply was dipped from the irrigation ditches.

As the city grew, underground wooden tanks were located at key points in the business district and filled from the irrigation ditches. These tanks provided the first fire protection service, and gradually the City Council allowed residents to extend small private pipes from the tanks to their homes for domestic use.

It was not until 1871 that the subject of installing a waterworks system was considered. In 1875, the actual work of laying pipes, installing valves, hydrants and service lines was begun. The water department was established in 1876, and the initial construction program was completed the following year.

The main water supply is obtained from five canyon streams arising in the western slope of nearby mountains. The headwaters of these streams vary in elevation from 7,000 feet to 11,000 feet above sea level, and include an area of 186 square miles of watershed land.

In 1934, the most serious water shortage occurred, and drastic restrictions were placed on the use of water. As it was determined early in the year that precipitation and snow cover would be very deficient, a program of deep well drilling was begun to partially relieve the shortage. In all, seventeen deep wells were drilled in various locations.

Three of the wells were complete failures, but the others were all used on an emergency basis during 1934. Since that time improvements and changes have been made in all installations, and only five of the

best wells are now operated as part of the normal supply to meet high summer demand.

Exercises

I. *Find in the text the answers to the following questions:*

1. When was Salt Lake City first settled? 2. Has the water supply problem always been of prime importance in this city? 3. How did the original settlers get the water they needed so badly? 4. What was the purpose of the underground wooden tanks? 5. Did these tanks provide the first fire protection service? 6. Where did the residents of the city get their water from in those days? 7. When was the subject of installing a water-works system considered? 8. Do you know what happened in 1875? 9. When was the present water department established? 10. Where is the main water supply obtained from at present? 11. Something happened in 1934. Can you tell us what actually happened then? 12. How many deep wells were drilled and what was the reason? 13 Three of the wells were complete failures, weren't they? 14. Is it true that five of the best wells are now operated?

II. *In the following sentences explain the meaning of the words in bold type. Translate the sentences:*

1. The new method is very efficient and, besides, it plays an important role in saving materials **as well.** 2. Building from top downwards and from bottom upwards has been accepted **as** a new method of construction. 3. A building must be erected **as** economically **as** possible. 4. An additional building has been designed **as** an extension to the main building of the factory. 5. Such materials **as** plastics and other synthetics are widely used **as** finishing materials. 6. **As** the temperature of the air increases care should be taken that the concrete does not get overdried. 7. That new school building is not so tall **as** we expected. 8. I saw our new foreman **as** he was getting off the bus. 9. He's a very good builder, young **as** he is. 10. Most teachers regard him **as** a clever student. 11. Vladimir works **as if** he has been doing the job all his life. 12. **As for** Peter, we never want to see him here again. 13. **As to** this young worker, the team leader will deal with him later. 14. Some of the students stood up **so as to** see the lecturer better. 15. Will the new superintendent be **as good as** his word?

TEXT 23B. THE FIRST WATER-SUPPLY SYSTEMS

Working in pairs, dwell upon the information presented in the text. Use the vocabulary given below.

The first primitive water-supply system was built nearly 3000 years before our era. In Ancient[1] Egypt wells were dug and water was extracted from them by means of devices similar to "storks"[2]. In Ancient China water was extracted from wells by means of winches and pulleys[3]. In Babylon water was extracted and raised to a high level by means of

pulleys and chain bucket elevators[4]. Earthenware, wooden, lead and copper pipes were used to distribute reservoir water.

During the Renaissance period[5] in Ancient Greece and in Ancient Rome whole water supply systems were created. In order to transport water self-running canals were built, which spanned valleys and gullies[6] in the form of special bridges, called aqueducts[7].

The first water-supply systems in Europe (Paris, London) were built in the 12th and 13th centuries.

In 1960 over 1300 towns and cities in the USSR had a functioning water-supply system. At present actually the whole urban population of the country is supplied with centralized running water.

The high quality of the running water testifies[8] to the perfection of the water mains built in the USSR.

Notes

1. **ancient** — древний
2. **"stork"** — «журавль»
3. **by means of winches and pulleys** — с помощью воротов и блоков
4. **chain bucket elevators** — нории
5. **Renaissance period** — эпоха Возрождения
6. **valleys and gullies** — долины и овраги
7. **aqueduct** — акведук
8. **to testify (to)** — свидетельствовать (о)

23C. DIALOGUE

Point out what main themes are dwelt upon in this dialogue.

Atomic Heat and Power Station on the Dniester

A.: Where did you say the construction of an atomic heat and power station is under way?
B.: It is under way on the banks of the Dniester River.
A.: That's not far from Odessa, is it?
B.: Right! It's near Odessa.
A.: Is it the first of its kind in the Soviet Union?
B.: It's the first of its kind, yes.
A.: How many generating units will it have?
B.: It will have two of them, each with a capacity of one million kilowatts.
A.: One million kilowatts! How remarkable, I should say!
B.: Living accommodation for construction workers and maintenance personnel has also been taken into consideration.
A.: What do you mean?
B.: All the construction workers and maintenance personnel will live quite close to the station.
A.: And when the station is ready, will it reduce the load on power systems fed from other stations?

B.: Definitely, it will! You mean the thermal power stations in Krivoi Rog and Zaporozhye, don't you?
A.: Exactly! Those are the stations I mean.
B.: When the station goes into operation it will result in great annual savings of coal, gas and mazut, won't it?
A.: It will! It will also enable about 400 small boiler-rooms to be closed.
B.: Is the station safe ecologically too?
A.: The station is absolutely safe ecologically too!
B.: That's wonderful, indeed!

UNIT 24. THE WATER PROBLEM IN THE USA

TEXT 24A. IS THE USA SLOWLY DRYING UP?

Ask and answer questions on the text:

It is estimated that by the year 2000, only three of the 18 federally designated water regions on the US mainland — New England, the Ohio basin and the South Atlantic-Eastern Gulf area — will be able to live comfortably with their water supplies. And even there, purity may prove to be just as serious a problem as shortages.

"The 1977 drought is only a test run of what will be experienced in other areas of the US by 1990, when every year will be a short water year," declares an official of the Western States Water Council in Salt Lake City.

Experts say that the nation's water problems may be every bit as difficult and expensive to solve as the energy crisis. Proposed solutions range from towing icebergs from the Antarctic to piping water from Alaska at a cost exceeding that of the 10-billion-dollar Alaskan oil pipeline.

And, as with energy, water shortages may force dramatic changes in American society. Agricultural production probably would decline sharply as prime farming regions turn to deserts. Many communities would be forced to limit their growth.

Self-Training Work

TEXT 24B

Read the text carefully and give it a title. Analyse the predicate in each sentence:

The prolonged drought that forced water rationing in the West and is withering crops in the South and Midwest is raising grave concern about America's long-range water supply.

So rapidly are Americans using water that even if the drought were to be broken immediately, virtually every section of the country would be confronted with serious shortages of drinkable water in the coming decades.

The authorities showed their concern about future water shortages in late June by offering legislation to penalize cities that fail to reduce their water use by 15 per cent.

In proposing the water-conservation measure the Environmental Protection Agency states: "In a nation that is facing increasing problems of water scarcity, within a world environment never removed from the grim specter of famine, conscientious public policy demands no less."

TEXT 24C. MODERN SYSTEMS ANALYSIS

Give a written translation of the text. Look up the new words in a dictionary:

The many constraints involving spatial and temporal water distribution needs, locations of future supply, uncertainty concerning future demand, the existing system, and many institutional factors make supply of water to New York City an interesting candidate for application of systems analysis tools. However it was not until the late 1960's that a formal but limited systems analysis was performed to determine the optimum capacity of a third delivery tunnel. The analysis was conducted by the Massachusetts Institute of Technology (MIT) at the request of the budget authorities of New York City. The Board of Water Supply (BWS), whose responsibility is to supply potable water, but not distribute it, had proposed a preliminary design consisting of about 50 miles of tunnels approximately 28 ft in diameter to meet their projected demand for water in the city. The design assumptions included a 25% population growth between 1970 and 2010, that the system capacity should handle the 2010 demand, that gravity flow only would be considered, and only one basic layout would be thoroughly investigated. Capacity considerations were based on a delivery pressure of 40 psi at the curb. The city budget authorities thought that the proposed design was of larger capacity than needed, balked at the cost, and requested the MIT analysis.

Despite the limitations imposed on the MIT group to study the supply problem only, they found that modification of constraints and examination of many possible network configurations via computer simulation produced one alternative design costing about one-half the BWS design. Many interesting details of the procedures used, identification of effectiveness measures, institutional constraints, and other system components have been examined by specialists in this field.

24D. DIALOGUE

Speak about the information presented in the dialogue:

A.: What does a water-supply system essentially consist of?
B.: It consists essentially of a source of supply.
A.: What may this source of supply be?
B.: Well, it may be a lake, a stream or a well.

A.: What's the purpose of a reservoir in a water-supply system?
B.: You see, water is stored in a reservoir and used whenever it becomes necessary to do so.
A.: When does this demand arise?
B.: It arises when the daily demand is greater than the daily flow of water.
A.: How is the water conveyed to the community?
B.: There is a pipe line or a conduit for the purpose.
A.: And suppose there are impurities in the water?
B.: All the impurities are removed by a treatment plant.
A.: Then the water is, I suppose, suitable for use, isn't it?
B.: Right! Then the water is quite suitable for use.

TEXT 24E. THE CONTINUOUS COUNTERCURRENT FILTRATION SYSTEM

Translate the text in written form:

The continuous countercurrent filtration system[1] includes chemical precipitation[2] and coagulation[3] directly followed by filtration through a filter bed[4]. The basic principle involved is continuous countercurrent filtration through a moving sand bed[5].

Chemicals are added directly to the influent[6] wastewater[7] line. Precipitation and coagulation occur[8] in the head tank[9]. The dosage of chemicals can be varied depending on the nature of the waste to be treated[10] and the quality of effluent[11] desired.

The filter medium, which could be other than sand, is contained in a tubular[12] shell (called a bed) and is driven in one direction while the wastewater being treated passes through the filter bed in the opposite direction. The filtering action occurs through the depth of the bed[13] as well as at its face. Filtered water flows out of the bed through discharge screens[14] located on the side of the bed. The sand and solids[15] filtered out of the water are pushed[16] by a hydraulic diaphragm[17] toward the head tank countercurrent to the flow of water. The solids are removed from the face of the filter bed by a mechanical face cutter[18]. After the diaphragm pushes the bed forward, it relaxes, thus allowing clean sand to fall into the space vacated[19] by the relaxing diaphragm. The frequency[20] with which the sand push-face cutting cycle occurs is varied to optimize flow rate[21] and effluent quality and is controlled automatically by the level in the head tank.

The sludge-sand[22] mixture mechanically removed from the filtering face falls down into the hopper bottom[23] of the head tank. This mixture is transferred to a washing column for cleaning. The clean sand is then returned by gravity[24] to the hopper. The removal and washing of the sand may be intermittent[25] or continuous. Final washing of the sand is accomplished by means of filtered effluent. Because the sand is removed, cleaned, and then returned to the system, the filtration process is not interrupted for backwashing[26] as it is in conventional practice. The waste wash water flows into a settling tank where the sludge is concentrated before dewatering. The settler overflow[27], or supernatant[28], is recycled to the influent line of the filtration process.

Notes

1. **countercurrent filtration system** — противопоточная система фильтрации
2. **precipitation** — выпадение или осаждение примесей
3. **coagulation** — коагуляция
4. **filter bed** — фильтр
5. **sand bed** — песчаная постель фильтра
6. **influent** — поступающий; втекающий
7. **wastewater** — сброшенная вода
8. **to occur** — происходить
9. **head tank** — головной резервуар
10. **to treat** — очищать
11. **effluent** — вытекающий поток
12. **tubular** — трубчатый
13. **the depth of the bed** — глубина загрузки постели (фильтра)
14. **discharge screens** — выходные сетчатые фильтры
15. **solids** — взвешенный слой осадка
16. **to push** — толкать
17. **diaphragm** — диафрагма
18. **face cutter** — нож для очистки взвеси
19. **to vacate** — освобождать
20. **frequency** — частота
21. **flow rate** — скорость потока
22. **sludge-sand** — взвешенный песок
23. **hopper bottom** — коническое дно
24. **by gravity** — под действием силы тяжести
25. **intermittent** — прерывающийся
26. **backwashing** — обратная промывка фильтра
27. **overflow** — переполнение
28. **supernatant** — всплывающий

Exercise. *Express the main idea of each passage in English:*

1. Сейчас водопроводные станции столицы подают 4,5 млн. м^3/сутки, мощность станций очистки сточных вод — 4,0 млн. м^3. Подача газа потребителям достигает 25 млрд. м^3/год, тепла — 18,500 Гкал/сутки.

2. В системе инженерного обеспечения города насчитывается более 15 тыс. км. магистральных трубопроводов, каналов, коллекторов и тоннелей, свыше 3500 км. дорог, 150 пешеходных переходов, десятки транспортных пересечений. Все это позволяет обеспечить высокий уровень жизни и деятельности большого многомиллионного города, каким является наша Москва.

3. Большие неприятности некоторым городам приносят растущие овраги, неукрепленные берега рек и водоемов, оползни (landslides).

4. Наша Родина по праву гордится построенными за последние десятилетия крупнейшими гидростанциями на Ангаре, Енисее и Волге, коренным образом изменившими энергетический баланс нашей страны.

5. Благодаря объединенным усилиям проектировщиков и строителей к 1975 г. было достигнуто увеличение мощности московского водопровода до 5 млн. м³/сутки, за счет расширения Северной и Восточной водопроводных станций.

6. Проводилась полная биологическая очистка сточных вод на мощных станциях аэрации с устройством отстойников (settling tanks), аэротенков, и дезинфицирующих установок. Очищенная вода не имела осадка, цвета и каких-либо загрязнений. Были созданы устройства по сбору и удалению осадков, которые использовались в сельском хозяйстве.

24F. DIALOGUES

Point out what main themes are dwelt upon in each dialogue:

Dialogue 1

A.: Do you think the process of purifying water is simple?
B.: No, I don't. It is not simple at all, as far as I know.
A.: Then you mean to say that it is complicated?
B.: You see, the process requires special equipment and lots of time.

Dialogue 2

A.: Is there a shortage of ground water in the USA?
B.: Oh, yes, there is! And in many places, I would say.
A.: Can you name a definite state?
B.: Sure, I can! Take California, for example.
A.: California? And what about Texas?
B.: There is a shortage of ground water in Texas, too!

Dialogue 3

A.: The supply of fresh water from the ocean is becoming more and more important nowadays.
B.: Right! But I'm afraid its cost will be very, very high.
A.: You see, the cost will be reduced by advances in technology.
B.: I've read that desalinated water will soon be used for such things as desert irrigation.
A.: That's true! But it'll still be in quite a few years.

Dialogue 4

A.: Can you tell me how many desalination plants there are around the world?
B.: I remember reading that there are more than 200.
A.: They say that the number is increasing. D'you think it is?
B.: It certainly is! The number of such plants is increasing rapidly. Very rapidly, I should say!
A.: Desalination plants require large amounts of power, don't they?
B.: They do, yes. They usually require very large amounts of power.

Dialogue 5

A.: D'you work at this desalination plant?
B.: No, I don't. But my elder brother does.
A.: How long has he been working at the plant?
B.: He's been working here for about 10 years already.
A.: Is he an engineer? A trained engineer, I mean?
B.: Yes, he's a trained engineer.
A.: What institute has he graduated from?
B.: He's a graduate of the Kiev Civil Engineering Institute.

UNIT 25. WATER AND AIR POLLUTION PROBLEMS

Self-Training Work

TEXT 25A

Repeat the tape-recorded text after the speaker. Give an oral translation of the following text and give it a suitable title:

Water and air pollution are the two main factors that destroy the environment in big cities. Paris has no industry, so the Seine is not polluted by industrial effluents but by sewer waters. However, this problem is being solved by building pollution-control stations in a Paris suburb. The sewage is channeled into them and cleansed before it goes into the Seine.

When visiting these installations, one can often see how pure the processed water is — the engineers who work there drink it quite cheerfully.

Water is purified by mechanical and biological methods, cleansed of admixtures and gases. The purified water is treated with chlorine and released into the rivers, whence it enters the water supply systems where it undergoes further, and finer, purification.

Air is polluted mainly by heating systems and cars. When you look at Los Angeles from a hilltop you get the impression of vapour lingering over the city. Fortunately, west winds dominate in Paris and they air the city. However, when there is no wind they have smog. As regards heating, they have started to use more mazut rather than coal. The most poisoned air is in the most modern quarters. For example, the 16th Department which is in the west end of the city and is aired by the west wind is a heavily polluted area.

District heating is an effective method. Several heat-and-power plants generate steam which is piped underground all round the city.

As for cars you know, of course, how heavy the traffic is in big cities. The slower the traffic, the more exhaust fumes are.

This problem will not be solved in the near future.

The acuteness of the problem depends on how well the country is developed and on the number of cars. Many of these problems are international in nature.

TEXT 25B. WATER POLLUTION IN THE USA (I)

Give a written translation of the text, looking up all the new words in a dictionary:

The problem of solving pollution from the technical view-point has turned out to be more difficult than expected.

First of all, it became evident that in certain reservoirs such great qualitative changes had taken place that it was practically very difficult to return them to their former state. Irreversible changes have taken place in the Great Lakes, because the disturbances in the organic environment of the lakes are irremediable.

New types of pollution are being discovered. In 1966 a stable and dangerous pollutant, called PChB (polychlorinated biophenyl), was identified. The danger is doubled because of the fact that PChB accumulates in the bottom sediments and is preserved in rivers for many years after it is no longer dumped into them. The concentration of this pollutant is very great in the Great Lakes, in such rivers as the Hudson, the Connecticut, the Mississippi, the Missouri, the Ohio, the Sacramento, the Rio Grande, and the Yukon.

The difficulties in combating PChB also lie in the fact that so far it has not been accurately established what kind of pollutants bring about its formation in reservoirs.

The variety of polluting sources is growing. The expansion of urban territories with asphalt-covered roads, the increase in the production and the complicatedness of the composition of chemical substances and combinations used in everyday life have led to the ever increasing role in polluting water resources played by the drainage from the territory of cities, towns and villages. Such scattered sources of pollution cannot be enclosed in a pipe with a purifier mounted on its outlet.

Besides that, the sphere of water pollution is broadening. During the recent years there appeared a new problem — the pollution of ground water. The pollution of ground water is caused by a great variety of reasons: numerous waste dumps scattered all over the area and exposed to the influence of rainwater, polluted surface reservoirs, the disposal of sewage from factories (waste matter as well), and the use of water on oil-fields.

TEXT 25C. WATER POLLUTION IN THE USA (II)

Render the following in Russian:

Water supply at the expense of ground water plays an important role in the lives of many towns and cities, and in the production of foodstuffs. The water supply of 12-15 million families depends upon individual underground boring wells, which have no purifying facilities. 71% of the public water supply is based upon ground water. The complexity of the issue lies in the fact that the physico-chemical processes of the transformation of ground water are still not fully explored.

Internal economic and political problems are impediments to solving the pollution problem. For several years conflicts have been taking

place between private companies, the federal government and the authorities of separate states. Back in 1973 the Bethlehem Steel Corporation, unwilling to spend about 100 million dollars on building purifying plants, undertook a desperate struggle against the laws protecting the environment of the state of Pennsylvania. By 1977 many industrial companies had not introduced the necessary methods of purifying sewage, and there is little hope that the 1983 targets planned by the law, will be met. The Association of the Chemical Industry, for instance, has declared that it is unrealistic to expect the modernization of purifying technology, as required by the law.

Quite often local authorities do not plan building a system of second time purification. Discussions are in progress, while in the meantime polluted water runs into reservoirs creating a threat to the health of the people, and complicating the second utilization of sewage.

The arms race and the energy crisis have an impact on the problem of reproduction of water resources. Attempts to overcome the energy crisis have brought about the postponement of many water purification measures.

The problem of providing the country with water resources is still far from being solved.

Exercise. *Write a summary in English:*

Среди живописных мест Подмосковья наиболее ценными в курортном отношении являются районы к западу от Москвы. Здесь прекрасные лесные ландшафты удачно сочетаются с климатическими и минеральными ресурсами, способствующими полноценному отдыху и лечению трудящихся.

Наиболее полно эти достоинства сконцентрированы в Одинцовском и Рузском районах. Здесь почти полностью отсутствует загрязнение окружающей среды, имеются водохранилища, обнаружены и используются подземные лечебные минеральные воды и грязи.

UNIT 26. HEATING, VENTILATION AND AIR CONDITIONING (I)

26A. DIALOGUES

Read the dialogues in pairs and then point out which of them contains the most important information. Write a review of the four dialogues:

Dialogue 1

A.: Are the two branches of engineering, heating and ventilation, connected?

B.: Definitely, they are. I'd say that they are very closely connected.

A.: I suppose that is the reason why they are treated as a dual subject. Don't you think so?

B.: You are quite right. Both are concerned with providing a required atmospheric environment within a definite space.
A.: What about air-conditioning? Is it related to heating and ventilation in any way?
B.: Certainly, it is! It is, I should say, very closely related to heating as well as ventilation.

Dialogue 2

A.: Can you tell me what the most widely used system of heating is?
B.: Well, I'm not an expert in this field, but I'm sure it is the central heating system.
A.: In the central heating system the fuel is burned in one particular place, isn't it?
B.: Right! That particular place may be the basement of a building or a specially designed room for the purpose.
A.: And then from there steam, hot water or warm air is transmitted to all the necessary places to be heated.
B.: You are quite right! That's what we call the central heating system.

Dialogue 3

A.: What two common systems of heating are widely used at present?
B.: The hot water system and the steam system are at present the two most common systems of heating.
A.: Say a few words about the way the hot water system works.
B.: Any hot water system consists of a boiler and a whole system of pipes which are connected to all the radiators in the building.
A.: What metal are the pipes usually made of?
B.: They are usually made of steel. But they can be made of copper too. In fact, copper pipes serve the purpose very well.
A.: And what happens to all the water when it cools?
B.: The cooled water is returned to the boiler where it is reheated.
A.: Is the hot water system used to heat the house you live in?
B.: No, it isn't. In our house the steam system is used.

Dialogue 4

A.: Can you tell me what the most common heating systems are?
B.: Sure, I can. They are the steam and the hot water heating systems.
A.: Will you tell me something about the steam heating system?
B.: In the steam heating system we have the single-pipe system and the two-pipe system.
A.: How does the single-pipe system function?
B.: In the single-pipe system the steam is conveyed to the radiator through a pipe at the bottom of one of the end sections.
A.: And what about the condensation which forms in the radiator?
B.: The condensation flows back through the same pipe.
A.: Say a few words about the two-pipe system, please.
B.: In the two-pipe system a separate system of piping is provided.
A.: What's the purpose of this separate system of piping?

B.: Its purpose is to carry away the condensation and in some cases the air from the radiator.

Exercise. *Translate the following into Russian in written form, using a dictionary. State what main points are dwelt upon:*

The Stockholm TV tower was built with slip forms, the concrete being poured at a rate equivalent to a rise of about 12 ft a day. The structure is anchored to bedrock by 72 prestressed steel rods of $1^1/_4$in. in diameter, buried to a depth of about 26 ft.

The ventilation installation comprises 18 separate systems and serves three principal purposes: the ventilation of general areas, the cooling of telecommunications equipment, and the airconditioning of the restaurant. A total of 65 fans and air treatment units are housed in fanrooms on 8 storeys. The total flow of inlet air is 2,500 ft^3/s.

Self-Training Work

TEXT 26B

Repeat the tape-recorded text after the speaker. Give the text a suitable title:

When designing a small home that is to be air-conditioned, many important factors must be considered to achieve economical installation and low operating costs. A system controlling the temperature, humidity and filtering of the air is adequate for home conditioning.

Units with very accurate controls, as used in industrial or large commercial installations, are not required for small residences.

A house to be efficiently and economically air-conditioned should be designed so that the heat gain is as low as possible. This is achieved by proper orientation, location of glass areas, and insulation and ventilation of roof. Natural elements such as trees, planting and water areas should be utilized to provide shade and cooling.

It is not necessary to have a sealed house or a square plan to air-condition efficiently. For the sake of economy and efficiency in the small home the center core plan is often advised. The central service core has the following advantages: 1. Economical structure. 2. Grouped plumbing. 3. Efficient ductwork. 4. Flexibility of plan around core to utilize orientation.

The air conditioning unit should be located in the center of the plan to minimize ductwork and insulation. Oversize units are as inefficient as undersized conditioning units. The proper unit that will operate steadily, rather than in surges of cooling periods, will provide better results, because between surges humidity builds up and destroys the comfort balance. Ideal interior humidity is 50%.

The cost and availability of electricity and water should be obtained to estimate operating costs of equipment. If supply of water is limited or expensive, conditioning systems with water saving devices are necessary.

Exercise. *Translate into Russian:*

The cities of Liverpool and Birkenhead are joined by a tunnel which goes under the river. It is one of the greatest underwater tunnels in the world. Its total length is over two and a half miles. From the very start of its construction it was realized that the ventilation of a tunnel of such length, which was to be used by vehicles (средства передвижения) propelled by internal combustion, would be a very difficult problem. Finally, a system of ventilation was adopted in which air is blown into the tunnel through ducts at roadway level (трубы, проложенные на уровне дороги) and drawn off (отводится) along the roof through exhausts (выпускные отверстия).

26C. DIALOGUES

Study the dialogues and read them in pairs. Choose a suitable title for each of them. Discuss the contents of each dialogue:

Dialogue 1

A.: What do you know about ventilation of buildings?
B.: Well, it's a very important factor in modern structures.
A.: Does it receive proper attention in housebuilding?
B.: There was a time when it didn't, but now it does.
A.: What should be done in this respect to have healthy living conditions?
B.: Every person in the building should have plenty of fresh air.
A.: Do you mean to say that there should be air changes as often as possible?
B.: Right! Any room with people in it requires at least three or four air changes per hour.
A.: Isn't one air change an hour sufficient?
B: No, that won't keep the percentage of carbon dioxide within reasonable limits.

Dialogue 2

A.: How is ventilation on the Moscow Metro carried out?
B.: It's carried out by a very ingenious air-supply system.
A.: And how are those millions of cubic metres of pure air pumped into the stations?
B.: A whole factory equipped with powerful pumps and fans is required for the purpose.
A.: Did you notice that all that equipment is completely out of sight?
B.: That's what I consider to be remarkable about the whole ventilation system of the Moscow Metro.
A.: I've read that several Metro stations have automated remote-controlled air conditioners.
B.: How interesting! We passengers simply take all this for granted.

Dialogue 3

A.: What is the average temperature in Moscow for the winter months?

B.: The average temperature is —10°C. On some days it's much lower.
A.: Does such a low temperature create any heating problems for the inhabitants of Moscow?
B.: None at all, I should say. Nearly all the flats have central heating.
A.: What about houses heated by stoves? Are there many such houses?
B.: No, not many. Such houses are found on the outskirts of the city.
A.: How much does heating in Moscow cost? Is it very expensive?
B.: Heating in Moscow and in other cities costs the inhabitants very, very little.

TEXT 26D. TRANS-EUROPEAN PIPELINES LINK ENERGY COOPERATION

Study the text and then render it in Russian in written form:

Trans-European pipelines now make it possible to heat Italy's buildings with Russian and Dutch gas. In June 1974, Italy completed the link between the two international pipelines that will ultimately provide the country with 420 billion cu ft of natural gas per year. The project represents unparalleled success in international cooperation and gives a much needed boost to Italy's energy budget.

Trans-European Pipelines. The first line starts in the USSR and travels 430 miles across Czechoslovakia and Austria. The second line emanates from Holland, crosses Switzerland, and ends at Mortara — a distance of 460 miles. Both termination points are near Italy's industrialized northern section. Each line will carry about 210 billion cu ft of gas per year.

The import contract for the Russian gas was signed in 1969 between USSR and the Italian state organization responsible for natural gas pipelines. Part of the supply will go into the French gas network as part of the USSR supply to the French Gas Authority.

Italy is heavily dependent on energy imports, and only about one-fifth of the total energy demand is met from indigenous sources, and half of this is made up by natural gas.

As far as world distribution is concerned, Europe's natural gas compares favourably with other continents. It has, for example, over half that of the USSR. The largest deposits occur in the USSR, which amount to four times the European total.

Heating with natural gas. The development of natural gas for heating installation in Italy is limited only by its availability. Not only is natural gas sometimes the only solution to meet the requirements of the 815 Anti-Smog regulations (for example, in Venice, natural gas and electricity are the only permitted forms of energy), but it is becoming the preferred energy source from a cost and utility point of view. Gas consumption for heating in the domestic sector has risen sharply over the last few years, 16 billion cu ft in 1960 to 60 billion cu ft in 1970 and 88 billion cu ft in 1973.

In large multistorey buildings heated by gas fired boiler plants, the trend is to put the boilers on the roofs. The atmospheric pressure combustion boiler is beginning to take its place in such developments,

although the idea of high output, atmospheric burners has been slow to gain acceptance by the industry.

Batteries of small heat exchangers are also used in larger buildings. The advantages are load flexibility and space saving.

Gas has played only a minor role in air conditioning, but there are signs that the market for the absorption chiller could expand in the near future.

UNIT 27. HEATING, VENTILATION AND AIR CONDITIONING (II)

TEXT 27A. A BUILDING NOTED FOR ITS HIGH ENERGY EFFICIENCY

Give a written translation of the text:

The California Department of General Services building in downtown Sacramento is noted for its high energy efficiency[1] and architectural beauty. A subterranean[2] base connects the building with a six-story solar slab structure that contains 12,000 sq ft of solar collectors.

The solar system integrates high intensity concentrating collectors that track the sun, absorption cooling, storage, ice-making screw compressors[3], heat recovery, and an air handling system. The collectors generate hot water, which is passed through an absorption refrigeration machine. The resultant chilled water is then pumped to air handling units. If the hot water supply exceeds the machine's needs, the excess is stored in tanks for use when solar hot water generation is difficult.

Efficient load management of the cooling cycle is accomplished through screw compressors that chill brine[4] fluid at night when power costs are low. The brine, at 14° F, circulates through steel pipes in the ice builder and produces 550 ton-hrs of refrigeration, which can be stored for daytime air conditioning. The storage system holds energy at both hot and cold temperatures so that a variety of functions can be performed economically. The city's central steam plant provides back-up[5].

A mini-computer control system optimizes system operation.

Notes

1. **energy efficiency** — энергетический потенциал
2. **subterranean** — подземный
3. **screw compressors** — винторезные компрессоры
4. **brine** — соляной раствор
5. **back-up** — поддержка

Exercises

I. *Answer the following questions:*

1. What does the subterranean base connect the building with? 2. For what purpose does the solar system integrate high intensity concentrating collectors? 3. The collectors generate hot water, don't they? 4. Does the generated hot water pass through a special machine? 5. Is that machine an absorption refrigeration machine? 6. The chilled water

is then pumped to air handling units, isn't it? 7. Suppose the hot water supply exceeds the machine's needs, what happens to the excess? 8. How is efficient load management of the cooling cycle accomplished? 9. Does the storage system hold energy at both hot and cold temperatures? 10. For what purpose is this being done? 11. System operation is optimized by a mini-computer control system, isn't it?

II. *Render the following text in English:*

Оригинальный способ обогрева старинных зданий Ленинграда предложили ученые киевского научно-исследовательского института. Они разработали проект котельной, которая будет расположена на ... крыше. Такое размещение позволит сохранить архитектурный облик кварталов, находящихся в отдалении от центральных тепломагистралей города. Котельные представляют собой легкие нагреватели, напоминающие газовые колонки.

Намечена широкая программа проектирования и строительства котельных на зданиях — памятниках архитектуры в городе на Неве.

TEXT 27B. MODERNISATION OF INDUSTRIAL PLANTS

Explain the meaning of the italicised words and word-combinations:

In an *air conditioned office building* or *factory*, as much as 120 ton-hrs *annually* can be saved by *properly shading* one 6 by 3 ft window. In one building, *the installation of screens* on 2 $^1/_2$ ft high strip windows on the two levels reduced the refrigeration peak by 53 tons and paid out in six years at energy rates current in the 1960s.

Energy reductions possible from applying various glass shading schemes to one 6 ft high by 1 ft wide window

Shading scheme	Estimated reduction in annual ton-hrs					
	New York City			Dallas		
	East	South	West	East	South	West
Single plate, no shading	15.6	18.0	27.0	33.6	36.0	58.2
Single plate, heat absorbent	8.6	11.1	16.5	18.6	22.2	35.4
Single plate, inside Venetian blinds	8.4	10.5	14.7	18.6	21.0	31.5
Single plate, reflecting	9.1	8.7	13.5	19.6	17.4	29.0
Single plate, 23 bar lowered screen	4.5	6.4	9.5	9.8	12.8	20.5
Single plate, outside vertical, automatic louvers	3.3	5.1	7.5	7.2	10.2	16.2

TEXT 27C. SPECIFIC ITEMS

Suggest a suitable title for each paragraph of the passage:

Replacement or modernization of mechanical equipment in a plant can increase efficiency. Pumps are a good example. Too often, pumps are taken for granted. All wear internally; excessive wear can be checked by a simple shutoff pressure test. If the discharge pressure of a centrifugal pump when shut off is below the expected performance curve, action to overcome the waste should be taken. Replacement of worn parts would be the normal maintenance action. However, the pump's performance curve should be checked for efficiency before it is repaired.

If cooling water is circulated to process equipment, it is essential to obtain the maximum temperature rise tolerable to each piece of equipment. Maximizing heat transfer reduces the circulation flow rate, pumping head, and energy consumption. Recirculating cooling water systems exist that operate on 2.3 or 4°F temperature rises because of unregulated flow. Such a system can be modernized by adding self-actuated temperature regulating valves at specific equipment, or at least, by adding control with plug disc valves.

Rinse waters respond to control also. Conductivity probes can be used with throttling or shutoff valves to limit or stop rinse water when conductivity drops to clean water level.

TEXT 27D. HOW METERING BE APPLIED

State what passages contain the most important information:

How metering be applied to plant utilities, such as water, soft water, hot water, steam, airconditioning, electricity, city gas, process gases, compressed air, sewage disposal, and solid waste disposal? The principle is universal. First, the total annual cost for the particular utility must be established. Then, the unit of allocation or base on which this expense will be distributed should be determined. For utility services, this is very often, but not always, the annual consumption in weight or volume units.

The total yearly consumption of soft water was predicted as 46,000,000 gal. The yearly cost was divided by the yearly consumption (the unit basis of allocation). This established the usage rate per thousand gallons. The installation of submeters is relatively simple for soft water.

A combustion efficiency test will indicate the need for modernization or replacement of any size boiler. In addition, regardless of the type of equipment, periodic flue gas analyses for CO_2 and stack temperature can guide firing adments to save 10 to 15 per cent of the fuel used. If tests show that the boilers are significantly short of the values, modernization is justified.

Turbines can replace induction motors that have lagging power factors, which add to an electric bill both in kilowatts and lower power factor. Backpressure turbines can exhaust to deaerating heaters, fuel oil heaters, water heaters, absorption refrigeration, and to any low pressure steam main.

A steam turbine can easily be applied to a boiler feed pump, condensate return pump, forced and induced draft fans, compressors, and centrifugal refrigeration machines. An oversized motor should be used wherever possible; and capacitors and synchronous motors should be used to correct power factors.

Before World War II, most commercial and institutional buildings had only heating and ventilating systems. Heat was provided primarily by steam or two-pipe hot water, standing radiation; ventilation was by either gravity or fan motivated exhaust systems. In rare instances, heated makeup air was provided.

TEXTS FOR READING

Engineering Reports. Engineering reports do not have to be hard to write or hard to read. The purpose of an engineering report is the communication of ideas — most often, the results of a project or experiment. It should be well organized, easy to read and easy to understand. At the same time, it should be concise, accurate and thorough.

All engineering reports have four basic sections — a summary, an introduction, a discussion, conclusions and recommendations. Following this standard organization makes writing easier for the reader, too. In the summary the objective of the project covered in the reports, and the major conclusions and the recommendations, are covered in a few sentences. This portion of the report enables the reader to decide quickly — if the information contained in the report is pertinent to his interests or responsibilities. If so, he'll read on to get the details.

The introduction presents the central theme of the report. The "meat" of the engineering report is contained in the discussion, which describes what was published. The conclusions are the answers to the questions that made the study necessary in the first place. The recommendations are specific requests for action based on the conclusions.

The Five Steps: There are five steps in effective report writing. Step 1 is to determine the objective of the report. Why is it needed? What subject or subjects should be covered? Who will read it? When is it due? Where can the facts be obtained?

Step 2 is to collect, evaluate and sort the data that will be used in the report. Sources of information are experiments, observations, interviews with other engineers, reference materials and, of course one's own experience. Tests to be applied when evaluating information are: Is it correct? Clear? Complete? Consistent? Objective? Pertinent? When these questions are asked of each bit of information, the data that serve to be included in the report stand out.

Step 3 in the preparation of an engineering report is to make an outline. The outline is the framework of the report. Once this framework has been constructed, the report is organized and writing the complete report is an easy task.

Step 4 is writing. Write without interruptions, if possible. Prepare a rough draft first. Use drawings, charts, photographs, graphs and similar visual aids where they help to make ideas clear. Be direct and precise. Avoid a formal, stilted writing style. Write as you talk. Keep sentences and paragraphs short.

Step 5 is editing and rewriting. Once the rough draft has been writ-

ten, it should be put aside for a day or two, then reread. Editing a rewriting — preparing the second draft — can then be started.

If the five steps have been followed, the report is clear and to the point. That's the final test of a good engineering report.

EXERCISES

I. *Study the new words and word-combinations which you find in the text.*

II. *Divide each sentence into sense groups and then read the sentence out loud.*

III. *Have your comrade translate the text orally by only listening to your reading.*

IV. *Have your comrades answer all your questions on the text.*

V. *Give the contents of the text in a nutshell* (в двух словах).

BUILDING MATERIALS

Corrugated Steel and Iron. On industrial buildings black or galvanized sheets of copper-bearing steel or pure iron are sometimes used as a cheap covering. The sheets are usually 26 in. wide with $2^1/_2$-in. corrugations and are given an end lap of 6 in. and side laps of 2 corrugations. They may be fastened by nailing to wood roof boarding or by clips and straps directly to the steel purlins. Sheets not galvanized should be well painted with red lead and linseed oil. Condensation of water on the underside of corrugated sheets may be prevented by stretching several layers of asbestos paper under the sheets supported on wire mesh stretched over purlins.

Glass. Flat glass is used for roofing greenhouses, and ribbed or prism glass may be inserted in domes or on the roofs of public buildings. Corrugated glass is often adapted to industrial buildings. When strength is required wire glass is employed. Glass inserts are often cast in cement slabs, and corrugated glass sheets may be used in connection with corrugated steel and asbestos. The ends are lapped, but the side joints are butted and covered with asbestos cushions and metal caps.

Plastics. Sheets made of thermoplastic acrylic resin (Plexiglass and Lucite) are available in flat and corrugated sheets. They may be employed in conjunction with corrugated steel and cement-asbestos board. Acrylic plastic is obtainable in transparent, or opaque sheets and in a wide variety of colors. This material is readily formed into curved shapes and, therefore, is often used in place of glass. Compared with glass, its surface is more readily scratched; hence it should be installed in out-of-reach locations. Polyester sheets reinforced with glass fibers are somewhat transparent and are selected when high impact strength is needed. These materials are available not only for roofing purposes but also for partitions and window glazing.

Stucco. Stucco is a plaster applied to the exterior of buildings to form a finishing coat. It is a very old method and was brought to a high development during ancient times in Greece, Rome, and Egypt, where lime and volcanic ash were mixed to form the material and pigments introduced to give it color. Before the introduction of Portland cement lime was much used in the United States to make stucco, and because of the rigidity of the old masonry walls, the care taken in curing the lime, and the number of thin coats applied very enduring lime stucco was produced. Changed conditions and the apparent necessity for speed have now largely eliminated the use of lime in stucco, Portland cement having taken its place almost entirely. A great variety of colors and surface textures have been developed to lend warmth and interest.

Bases for Stucco. Stucco is usually applied to walls of concrete, brick, hollow tile, concrete blocks, or wood frame. In all cases the wall must be stout and rigid and free from shrinkages and settlements, for any movement in the wall will cause cracks in the stucco. The bond between the stucco and the wall must likewise be assured; otherwise the coatings will not adhere, and cracks and loosened areas will result. Concrete walls often are brushed with wire before the surface is hard to produce a roughened face. Hollow tile, concrete blocks, and brick should be clean and have a rough texture. The tops of stucco walls should be properly protected by projecting eaves or by flashing to prevent water from penetrating behind the stucco. Stucco walls should never come in contact with the ground. Wood and gypsum lath should not be used for exterior stucco. Stucco should never be applied when the temperature is below 32°F.

ACOUSTICAL MATERIALS

Acoustical Problems. The task of selecting the proper type, locar tion, and amount of materials in the solution of acoustical problems requires the services of an expert. The use of materials alone is no panacea for faulty acoustical design. Many different substances have been developed in an attempt to solve the problems of sound control. Among those encountered are: the achievement of good hearing conditions in auditoriums, concert halls, lecture rooms, etc.; the reduction of undesirable noises at their source (industrial operations, typewriter and computing machine noises, lunch room clatter, etc.); and in the reduction of sound transmission from one space to another. In general, the materials used are acoustical plasters, acoustical tiles, acoustical baffles, acoustical blankets, and sprayed-on materials.

Mineral Tile. Mineral tile consists of rock lath and a binder, the surface being either fissured or perforated. Its cost and efficiency are somewhat higher than cellulose-fiber tile; it is incombustible and may be repainted. It should not be used in locations in which there is high humidity nor at the lower parts of walls where it may be damaged by abrasion or blows. It may be obtained in sizes 12×12 and 12×24 in. and in thicknesses of $^{5}/_{8}$, $^{3}/_{4}$, $^{13}/_{16}$, and 1 in.

Glass-fiber Tile. Glass-fiber tile is composed of glass fibers held together with a binder. Its characteristics are similar to those of the mineral tile and, in addition, it is considerably more heat-resistive and has fair moisture resistance. The tile sizes are 12×12 and 12×24 in.; thicknesses are $^3/_4$ and 1 in.

Perforated Asbestos Tile. The tile is made of cement-asbestos board with an inorganic wool backing and excellent moisture and abrasion resistance. It is available in 12×12, 12×24, 24×24, and 24×48-in. sizes and in $^3/_{16}$-and $2^3/_{16}$-in. thicknesses.

Acoustical Blankets. Acoustical blankets are made of mineral wool, wood fibers, glass fibers, and hair felt. They are generally covered with a perforated covering of metal, plywood, fiberboard, or other material and may be obtained in thicknesses of $^1/_4$ to 4 in. Their efficiency is high, particularly in the low-frequency range, and they are used extensively in television, radio, and sound recording studios.

Acoustical Plaster. Acoustical plaster is the least expensive of the various acoustical materials. It has relatively low sound-absorbing coefficients, it is difficult to clean, and repainting may result in a lowering of its acoustical efficiency. When using this material the final finish plaster coat is replaced with two coats of acoustical plaster. The material should be applied in strict adherence to the manufacturers' instructions.

Applying Acoustical Materials. In addition to applying acoustical materials by plastering and spraying, tiles are held in place by adhesives, nails or screws. When an adhesive is used spots of a special adhesive are placed at the four corners of the tile. This work must be done carefully to prevent the tiles from becoming loose. The use of nails or screws avoids this danger.

BEAMS

Elastic Curve. When loads are applied to a beam it bends or changes shape. The vertical distance moved by a point on the neutral surface during the bending of a beam is the deflection of the beam at that point. The trace of the neutral surface on a vertical longitudinal plane is called the elastic curve of the beam. The resistance to deflection is called stiffness. Generally it is necessary that a beam be stiff enough as well as strong enough. A floor beam may be sufficiently strong to carry the load on it, but its deflection may be so great that a plastered ceiling would crack or the floor would vibrate. The general requirement for the deflection of beams is that the deflection not exceed $^1/_{360}$ of the span. For instance, the maximum deflection permitted in a beam having a span of 30 ft would be 1 in. It is necessary, therefore, that the deflection of beams be computed. Formulas used to find the deflection of beams are valid only when the stresses caused by bending are below the elastic limit of the material.

Walls. Because of the greatly increased use of steel frame construction independent bearing walls of brick are now almost never built over two or three stories in height. Steel frame with enclosed walls supported at each story on the steel have proved a more economical type of construction for the taller buildings. The proper thicknesses for bearing walls depend on the loads and are consequently determined by the safe stress allowed per square inch on the brickwork. The building codes, however, publish tables which are required as safe for the various heights of walls.

The minimum thickness for solid brick exterior bearing and party walls should be 12 in. for the uppermost 35 ft and should be increased 4 in. for each successive 35 ft or fraction thereof measured downward from the top of the wall. When solid brick exterior bearing and party walls are stiffened at distances not greater than 12 ft apart by cross walls or by internal or external offsets or returns, at least 2 ft deep, they may be 12 in. thick for the uppermost 70 ft measured downward from the top of the wall and should be increased 4 in. in thickness for each successive 70 ft or fraction thereof. In the case of one-story buildings, or of three-story buildings not over 40 ft high, 8-in. walls are permitted when having unsecured heights of not over 12 ft and horizontal roof beams with no outward thrust.

Basement Walls and Footings. Common bricks are very little used at the present time below grade because they do not withstand the moisture and frost as well as stone or concrete. For light buildings in dry soil, basement walls of brick may still be built, but only the hardest and soundest bricks should be used, laid up in Portland cement mortar, and thoroughly slushed and grouted so that all joints are filled.

Brick basement walls should be at least as thick as the walls above them and never less than 12 in. Many building codes require them to be 4 in. thicker than the wall above, but this thickening is unnecessary, since fewer openings render the unit compressive stress less than in the superimposed walls. Also, as a retaining wall it owes its stability to the weight above, and the addition of 4 in., except in very thin walls, increases its resistance to side thrust very little. If, however, upon investigation it is found that the stresses due to earth pressure and superimposed building exceed the specified safe working stress, then the thickness of the basement wall must be increased to bring the stresses within the specified limit.

Footings are now never made of brick, concrete being more satisfactory even under a brick basement wall.

Reinforced Concrete. Plain concrete was used in ancient times by the Egyptians and the Romans and probably by the Mayas in Central America. Sewers, roads, aqueducts, water mains, and foundations were constructed of mass concrete by the Romans, who also employed it as a filling between the brick and stone ribs of their vaults and arches. The knowledge of the use of natural cement and, consequently, of concrete seems to have been lost during the Middle Ages, and it was not until the eighteenth century that its value was rediscovered.

The reinforcing of concrete was first introduced in France in 1861 by Joseph Monier, who constructed flower pots, tubs, and tanks, and François Coignet, who published theories of reinforcing for beams, arches, and large pipes. Very little was actually accomplished in building construction until twenty-five years later when German and Austrian engineers developed formulas for design, and Hennebique in France began the use of bent-up bars and stirrups. Between 1880 and 1890 several reinforced concrete buildings were erected in the United States, and since 1896 the increase in the amount of construction with this material has been remarkable.

Until recent years there was a tendency among architects to consider reinforced concrete as a method of construction suited only to heavy and massive structures, to foundations, bridges, dams, factories, warehouses, and industrial buildings. This feeling was perhaps due to the apparent bulkiness of the material and to the fact that the wooden forms for plain flat surfaces, beams, and columns cast less than for curves, arches, and domes. The characteristics of the architecture were limited by the economical restrictions of the centering. Much study and experiment have, however, led to vast improvements in the manufacture of the concrete, in the efficiency, and simplicity of formwork, and in the development of plastic molds and of self-centering reinforcement, such as ribbed fabrics. Indeed, at the present time unlimited possibilities in flexibility, slenderness, and aesthetic qualities of design appear to be in the hands of the creators of concrete buildings. The capacity of reinforced concrete is, in the opinion of many architects, not yet realized. The potentialities of a substance which can be poured into any form or shape from delicate ornament to huge cantilevers and parabolic arches and which is monolithic throughout its mass should indeed inspire methods of expression distinctive of its structure and quite different to those called forth by the disjointed elements of steel, wood, brick, and stone.

Designing Concrete Buildings. Buildings of reinforced concrete may be constructed with load-bearing walls or with a skeleton frame. According to the first method, the exterior walls are designed of sufficient strength to carry the loads of the girders, beams, floors, and roofs which rest on them. The interior supports may consist also of load-bearing walls or of columns, but this method does not utilize the full potentialities of concrete. By the second method, the floors and roofs rest directly on exterior and interior columns or are carried on beams and girders which, in turn, rest on the columns. The walls and partitions are simple enclosures of brick or reinforced concrete supported by the beams and girders. Most concrete buildings of any size are now designed according to this second or skeleton frame method.

Beams. Concrete strongly resists compressive stresses but is weak against tension; therefore to render it a practical material for the construction of beams, columns, and other structural members, steel rods or bars are combined with the concrete, while it is still soft, to resist

the tensile stresses; the concrete itself is depended on to take care of the compression. Upon hardening or setting, a fairly strong bond is formed between the concrete and the steel. The rods are, of course, very carefully placed in those parts of the concrete member (beam, girder, or column) where the tensile stresses will occur.

It is well known that when a beam supported at each end is loaded there is a tendency for the beam to bend; the fibers in the upper part are compressed together and those in the lower part elongated. The fibers at the extreme top and bottom of the beam are in the greatest stress, and the stress diminishes in the fibers as they become more remote from the top and bottom surface, until at a plane called the neutral surface there is no stress either compressive or tensile. In the cross section of a rectangular beam of homogeneous material the neutral surface is at the center, the fibers above the neutral surface being in compression and those below in tension.

Bond. The resistance of the steel reinforcement to tension can function only through the adhesion between the concrete and the steel, called the *bond*. This perfect adhesion is one of the fundamental assumptions in the design of reinforced concrete. If the reinforcement slips through the concrete, its power of resistance is lost and tensile stresses are brought on the concrete, which has little ability to withstand them. The examination of the reinforcement for bond stress after it has been designed to resist tension and shear is therefore very important. The adhesion between the two materials is caused by the shrinkage of the concrete in setting and by the frictional resistance of the bar or rod. The steel should never be polished, since the friction is thereby reduced and a slight rust adds to the bond. Loose rust and scale should be cleaned off with wire brushes. In order to increase the anchorage deformed bars are rolled with closely spaced lugs or projections on their surfaces to engage the surrounding concrete; the ends of the bars may also be formed in a hook for situations in which sufficient longitudinal contact cannot be obtained.

Cantilever Beams. Cantilevers have long been used for carrying the overhanging balconies in theatres. Also in modern design they are taking an important place in the support of exterior walls and projecting upper stories when the main columns of the building are set well back of the building line.

Beams of Limited Depth. Rectangular beams are economical when the ratio of depth to width is from $1^1/_2$ to 2. Occasionally cases occur in which headroom is limited, thereby decreasing the available depth for the beam. This condition is sometimes found at stairways. In such instances it may be necessary to make the beam much wider than the economical proportions require.

Concrete Floor Construction. Fireproof buildings demand fireproof floor construction, and the efforts to fulfill this demand have led to the development of many types of floor systems, some of which have

proved to be of practical importance and some of which have vanished. Those which have persisted and are now in general use may be divided into six classes:

1. Structural hollow tile arches.
2. Precast gypsum slabs.
3. Stone concrete beam and slab.
4. Stone concrete joists and slab with tile fillers (combination).
5. Cinder concrete and gypsum slabs cast in place.
6. Flat reinforced concrete slabs (girderless).

Structural hollow tile arches are not computed according to the principles of reinforced concrete; they are seldom used today. They are employed only with steel beams.

Precast gypsum slabs are used only in steel construction.

Stone concrete beam and slab construction consists of concrete cross beams running between girders and columns, and enclosing floor panels which are covered over with reinforced stone concrete slabs. An economical arrangement of beams is at the $^1/_3$ points of the girder span giving a spacing of about 8 ft 0 in. center to center for the beams. Long-span slabs running between girders with beams omitted are also used when the loads are light.

Joist or ribbed-slab construction, also called the combination system, consists of a concrete slab supported on concrete ribs running in either one or two directions cast between fillers of hollow terra cotta or gypsum blocks or of metal pans. The ribs are spaced 16 to 25 in. apart, depending on the size of the fillers. The system is light in weight and is adapted to the lesser floor loads. It should be used only with concrete beams for greatest efficiency.

Cinder-concrete and gypsum slabs cast in place are slabs with one-way reinforcement. Their spans are usually limited to 8 ft 0 in. They are light in weight and are used in steel buildings with small live loads. The low values assigned to cinder concrete by building codes generally favor stone-concrete slabs.

Flat-slab construction, originally called the "mushroom system", consists of a slab only, supported by the columns without the introduction of beams and girders. The columns have wide flaring capitals, and the slab in the vicinity of the capitals is generally thickened into a dropped panel. This system is economically adapted to live loads of more than 100 psf and to column spacing up to 30 ft 0 in. It is not used with steel construction.

One-Way Slabs. A one-way slab is a concrete slab in which the longitudinal tensile reinforcement runs in one direction only. Such slabs are economical for spans of $6^1/_2$ to 8 ft, although, with light loads, the economic span length may be as great as 12 ft. Welded wire mesh is sometimes used because of the saving of labor in placing the reinforcement. The wire mesh is used only when the required steel area is comparatively small, under 0.2 sq in. per foot of width of slab. In preliminary designs the thickness of the slab is often taken to be $^3/_8$ to $^1/_2$ in. per foot of span,

depending, of course, on the magnitude of the load and the strength of the concrete to be used.

Two-Way Slabs. The two-way slab has two systems of longitudinal tensile reinforcement bars. It is used only when the ratio of length to width of panel does not exceed about 1.3. It is economical when the floor panel is square or nearly so and when the supporting beams (which must be on four sides of the panel) coincide with walls and partitions. The supporting beams must be of reinforced concrete. When this condition occurs the system has certain advantages offered by the flat slab. For panels that are not square the greater percentage of the load is taken by the rods that extend in the shorter direction.

Cinder Concrete Slabs. These slabs are light in weight and are easily and quickly constructed, the formwork being hung by wires from the structural beams. They are used with steel frame only and not with concrete. The slab cannot be less than 4 in. thick, according to most codes, and the unit compression stress is limited to 300 psi. A hung ceiling is generally necessary to cover the bottom flanges of the beams. The weight of cinder concrete is taken as 108 lb per cu ft, and the mixture should never be leaner than 1:2:5. Spans should not exceed 8 ft 0 in. Although cinder-concrete slabs were once used extensively, the comparatively low allowable stresses assigned to cinder concrete by most building codes make the material uneconomical.

Flat-Slab Construction. Flat-slab construction is also called girderless floors. The term refers to concrete slabs built monolithically with the supporting columns, without beams or girders to carry the loads, and having reinforcement bars extending in two or four directions. Normally, slabs extend in each direction over at least three panels and have approximately equal dimensions and a ratio of length to width of panel not exceeding 1.33. The advantages of the flat-slab type of floor over the beam and girder type are:

1. Greater load-carrying capacity for a given amount of concrete and steel. Generally more economical than other systems for heavy loads.
2. Flat ceiling with greater fire-resistive qualities because there are fewer sharp corners and better accommodations for sprinklers, piping, and wiring.
3. Cheaper formwork.
4. Floor height saving of 12 to 18 in. per story or a saving of one in nine stories.
5. The absence of beams permits more light from windows throughout the building.

Flat slabs are best adapted for spans under 30 ft 0 in. and for live loads greater than 100 psf. They are most suitable for warehouses, factories, and garages, where the panels are regular and nearly square and where the large columns and flaring capitals are not objectionable. A development of the flat-slab system combines it with the two-way ribbed-slab system. It permits column spacings of 50 ft and more.

Pressed Wood. Sheets of felted wood fiber with smooth surface formed under heat and great pressure are now used in a variety of ways for wall covering, exterior and interior finish, framework, and backing. The oil and turpentine are removed from the wood in the process of manufacture, and the material is generally classed as slow burning. Its moisture absorption is low, and it may be cut and nailed in the same way as wood. Its thickness varies from $^1/_{10}$ to $^1/_2$ in., and its surface is usually 4 ft wide and 12 ft long.

Plastics for Architectural Purposes. Plastics have been greatly developed for floors, wall coverings, wainscoting, table and counter tops, and for other architectural purposes. The finish may be in plain colors and textures, or thin wood veneers may be incorporated with the plastic bases under heat and pressure to provide a genuine wood finish. Simple weave and inlay designs of the same material or of metal are possible, and photographic murals may be pressed into the sheets.

For wainscoting, the material, $^1/_{16}$ in. thick, is glued to a plywood of pressed-wood backing which is nailed to grounds; or it may be applied directly to plastered walls. The joints may be splined butt joints or covered with metal moldings. The sheets have a maximum size of 4×12 ft.

Styrene wall tile is available in a wide color range and often takes the place of ceramic glazed tile.

Vinyl and Vinyledene sheets and fabric are used in the same manner and have a much longer life than wallpaper. This material may be mounted on plywood or other backing.

Cinder blocks are sometimes coated with $^1/_4$-in. fiber-reinforced, polyester resin facing. This surface is readily cleaned and is produced in a variety of colors. It is not recommended for exterior work.

Phenolic laminates have been developed for use as table and counter tops, wainscoting, and wall coverings.

Cement Floors. A mixture of cement, sand, and water produces a finished floor surface which, when spread over the under flooring, is most excellently adapted to fulfill many conditions. A cement floor may be worked into the top surface of the concrete floor slab before it has set.

Prestressed Concrete. The theory of prestressed concrete was originated in Germany about 1888, but, because of the poor quality of concrete, the tests were unsuccessful. In the USA it was first used in the 1920's in the construction of tanks and pipes. It was in Europe, however, that the development of its structural application received greatest attention. Here the costs of materials were relatively high and labor costs were low. Eugene Freyssinet of France is responsible for the first practical prestressing. This was about 1928. In 1939 he developed the cable-and-jack method of prestressing as applied to post tensioning. Gustave Magnel of Belgium introduced a similar method. Because of war demands metal was conserved for armaments and munitions, and the great savings of steel, made possible by prestressing concrete, served

as an impetus in the development of this new type of construction in European countries. In the USA, because of vast quantities of lumber and the development of timber connectors, timber was substituted for steel. Thus, it was not until about 1950 that prestressed concrete was used for structural purposes.

Prestressing. A prestressed concrete beam is a combination of concrete and steel arranged and stressed so that the normal load or loads on the beam will produce no tensile stresses within the concrete. This is accomplished by placing the member in compression prior to applying the loads. The principle involved is illustrated by a row of books placed side by side. Taken as a unit the row of books has no structural strength. If, however, a compressive force is exerted against the ends of the books the row may be lifted as a unit, thus exhibiting the ability to support its own weight. If sufficient force is maintained at the ends, the row of books could act as a beam and support a superimposed load.

Pretensioning. Prestressing is accomplished by one of two methods, pretensioning and posttensioning. In pretensioning, or bonded prestressing, the wires or cables are placed in the empty forms and pulled to their required tensile stress by means of hydraulic jacks. The concrete is then poured into the forms and allowed to cure. The jacks are released, and the stress in the wires is transferred to the concrete by the bond between the two materials. This process has been used extensively in Europe and is gaining favor in the USA. It does not require permanent anchorage at the ends of a beam and is particularly adapted to shop fabrication when many similar members are required.

STRUCTURES

Domes. Masonry domes have been constructed for centuries, but in modern times the masonry has been largely supplanted by steel and concrete. If the joints in the steel structure can be made rigid by welding or by the use of triangular shapes, the outward thrust from the arch form is resolved into the lower horizontal ring, thus placing this ring in tension; the upper ring is in compression. Diameters of over 300 ft have been spanned by this method of construction.

Shells. Shells are similar to domes in that they transmit forces in three dimensions. This results in a great economy of material; in fact no other system of construction utilizes materials so efficiently. Shell construction for buildings is of concrete, although some experiments have been made with shells of plywood and transite. Shells have been made in a wide variety of forms. The almost unlimited latitude in design forms is one of the main advantages of shell construction.

Purpose of Foundation. If the weight of any building exceeds the bearing resistance of the material, either soil or rock, on which it rests, the material will give way and the building will sink. The amount of

this sinkage may be the same under all walls and columns, in which case the building will settle uniformly. All foundations, with the exception of those on bedrock, may be expected to settle. If slight settlement is equal throughout all parts of the building, no serious consequences will result. When, however, the settlement is greater under some portions than under others, due to greater loads or to less resistance of the foundation bed, the building will settle unevenly. The walls will no longer be plumb nor the floors level, and more or less serious fractures may appear under the diverse stresses involved. The cracking of plaster and binding of doors are common results of uneven though perhaps slight settling of the structure. Differential settlements of more than $^3/_4$ in. may result in serious consequences to reinforced concrete or other continuous structures. But not all cracks in buildings are caused by settlement. Shrinkage of concrete, wood and plaster and thermal expansion and contraction are also contributing causes.

Those portions of a building resting on the soil or rock are known as the foundations or footings, and careful study must be given to their area and strength and also to the characteristics and resistance of the bed upon which they rest to avoid all settlement, if possible, but in any case to escape the perils of unequal settlement.

Three general methods are in use to procure a firm foundation bed on which to erect the building:

1. The foundations are spread out to distribute the load over the bed so that the safe bearing power of the bed per square foot is not exceeded.

2. Excavations are made down through unstable materials until a stratum of soil or a bed of rock is reached which has bearing power sufficient to sustain the loads. The foundations as a whole or the footings under individual walls and columns are then built on this satisfactory base. Such footings may also be spread to distribute the load as in the first method.

3. Long shafts of wood, concrete, or steel, called piles, are driven into the ground until they are sufficiently embedded to carry the loads without further sinkage or until their lower ends rest on rock. The footings and column bases are then built on the tops of the piles.

Depth of Footings. The bottoms of all footings should lie well below the level of the deepest frost penetration. This may vary from less than a foot in mild climates to 8 ft or more in the northern sections of the country. Local building codes often give the minimum depth of footings. Water in the soil expands on freezing, and, if this occurs below the footing, the resulting "frost heave" may crack foundations and throw walls out of line. Foundations should never be built on frozen ground.

Sheet Piling. The chief difficulty connected with dry soil excavation is the tendency of the earth sides to fall to the bottom of the pit. This tendency is greater in loose sand and gravel than in cohesive soil, such as hard clay, but in all cases, when the digging extends to any depth, protection should be maintained against possible cave-ins. The type of protection depends on the size and shape of the excavation.

For spread footings, which are generally rectangular or trapezoidal in plan and of some extent, sheet piling consisting of wood planks or steel sheets driven on end into the soil ahead of the digging is employed. The wood sheet piling is composed of 2- to 8-in. planks about 12 in. wide and may be used in single thicknesses side by side or bolted together in three layers so arranged that a tongue is formed on one side of the section and a groove on the other. This type is less likely to buckle than the single planks and provides a tight joint between sections. Steel sheet piling has come into general use. It consists of lengths of steel plate about $^1/_2$ in. thick and 12 to 16 in. wide provided with interlocking joints along the sides. Two types of sections are made, the arched web and the straight web, the former being stiffer against buckling. Steel sheeting is higher in first cost but is easier to drive and can be reused more often. When the conditions are not too difficult and the piling is to remain in place wood sheeting is probably still the cheapest.

In all cases borings should be made to determine the depth to which the sheet piling is to be driven.

Wood and steel sheet piling is largely used for holding the banks of basement excavations. All such sheeting must be strongly braced to withstand the earth pressure, especially in crowded cities where any settlements or cave-ins would be most dangerous to adjoining buildings and streets. The bracing may be set horizontally between opposite banks or consist of sloped shoring with the heels of the braces held by temporary piles driven in the basement bottom. If the pressure is very great, two lines of sheeting are sometimes used or a trench is dug at the building line or the sidewalk curb line before excavation begins. This trench is then filled with concrete to form the wall and the basement is dug inside. Bracing must be introduced to hold the walls in place as the excavation proceeds and before the columns and girders are in place.

Moderate amounts of water encountered in the excavation of basements and cellars may be drained to a sump pit from which it is pumped to the sewer. When the water occurs in large quantities that cannot be eliminated through sumps the excavation is enclosed with some type of cofferdam.

Excavation in Wet Ground. The presence of water in large quantities in the soil creates a very serious condition and special methods are used to control it. Water by its own presence not only renders the process of excavation difficult and often impossible for the workmen, but it also causes soil to flow, thereby converting it into a material most difficult to restrain or direct. In many cities on the seacoast or near lakes and rivers the soil constantly contains large amounts of water up to a level called the ground-water level. This level is often only a little below the surface, and the water-soaked soil must be penetrated to arrive at good rock or adequate bearing below. Springs and underground streams are also sometimes encountered in excavating. Consequently it may be necessary to take special precautions to eliminate the water from the area where the digging occurs. The following general methods are employed in conditions of this sort:

1. The entire area is surrounded with a watertight construction, known as a cofferdam, ahead of the excavation, and the digging is then carried on in the dry.

2. Watertight compartments called caissons are sunk as the excavation proceeds, and the digging is done inside the compartment.

Cofferdams. Any watertight construction, such as sheet piling, is a cofferdam, but the term is usually applied to the more elaborate structures on a large scale. In building construction they are employed especially to enclose the whole or an appreciable part of a building site in order to prevent the water from entering. The cofferdams may consist of wood piling when the depth below water level does not exceed about 10 ft. For greater depths sheet steel piling is employed. Careful bracing must be applied as the excavation proceeds to withstand the earth pressure on the outside. Cross bracing composed of the structural girders can sometimes be employed, the interior columns being introduced after their footings are completed. Cofferdams are used in the excavation of basements or of large boiler and machinery pits below the basement floor level.

Column piers, when sunk in the presence of water to greater depths than the basement floor, may be laid through steel cylinders, but special attention must be given to sealing the bottom of the cylinder with concrete to prevent the entrance of water. The soil inside the cylinder may be loosened with power-driven cutter heads on vertical shafts lowered into the tube. After the removal of the cutter head the soil is hoisted out with buckets. When the footings are of large size either open or pneumatic caissons are used.

In sand sheet piling is often slow and difficult to drive, and the well-point method has proved more practicable. This is accomplished by laying a line of 6-in. pipe, or larger, around the building site and tapping into this line at regular intervals $1^1/_2$ or 2-in. vertical pipes with well points at their lower ends. The sand is softened with water jets, and the vertical pipes and points are then easily sunk to the required depth.

Waterproofing and Dampproofing. Unless some method of prevention is employed, moisture from the outside earth is liable to penetrate foundation walls and cause cellars and basements to be objectionably damp. Even in well-drained soils with no permanent moisture rainwater will often enter the walls with undesirable results. When there is a definite water content in the soil from nearby ocean, rivers, lakes, or springs pressure results which causes continual leakage into the substructure.

The general conditions may then be classified as:

1. Surface water only with little or no hydrostatic pressure;
2. Permanent water in the soil with a definite hydrostatic pressure.

Different methods of preventing dampness in the substructure are employed in these two conditions.

Surface Water. Drainage of the foundation wall is usually all that is necessary in the case of rain and snow from the surface of the ground

with no standing water in the soil. The drainage may consist simply of a back filling of loose rock to collect water, which would otherwise follow along the wall, and to lead it away from the building; or a drain pipe with open joints may be laid in the bottom of a trench next to the wall. The water is carried to the sewer or, in the case of isolated buildings, to a dry well. A method sometimes used when the water might weaken the soil under the wall footing is to lay drain pipe and loose rockfill in a trench several feet away from the basement wall, thereby keeping the water entirely away from the building. When this method is used the surface of the ground, between the trench and the building, should be covered with an impervious material. If impervious clay is overlaid with porous gravel or sand, the drain need not be deeper in the clay than 12 in.; otherwise it should extend to the basement floor level. Hollow tiles are sometimes laid all over the earth bottom, especially when wood finished flooring is used in rooms with no basement under them. No actual waterproofing of the cellar walls and floor is usually necessary in the case of surface water only; dampproofing the walls and drainage of the foundations is sufficient. When a building is situated on sloping ground, however, waterproofing may be required on the wall toward the increased flow of surface water.

Ground Water with Pressure. Now that the basements of large buildings often extend below ground-water and tide levels, the question of rendering the substructure watertight becomes very important. The systems of waterproofing may be classified as:

1. Absolute pressure waterproofing;
2. Waterproofing with drainage.

In absolute pressure waterproofing the effort is to transform the basement walls and floor into an absolutely watertight basin which will withstand the water pressure or hydrostatic head. This pressure may be very powerful and necessitates heavy concrete floors and even reinforced slabs to withstand the head. Many cases have occurred in which the entire basement floor has been raised in waves and sometimes has cracked and disintegrated under the pressure of the water in the soil beneath it. The amount of resistance required can be determined from the amount of hydrostatic head, which depends on the position of the ground- or tidewater level in relation to the cellar bottom, or from the flow of subterranean springs when they are present. The absolute pressure method is usually adopted when the water pressure is moderate and has been employed with success under great hydrostatic head.

COLD-WATER SUPPLY AND DISTRIBUTION

All the water we use derives initially from the oceans and is made available to us by the rain cycle. Water at the surface of the ocean is evaporated by the heat of the sun, to rise and form clouds of water vapour. These clouds are swept towards the land by the incoming sea breezes. Where there are hills the clouds are carried upwards into a cooler

atmosphere and condensation takes place in the form of rain. The cycle is completed when the water so falling on the land drains away to streams and rivers and is carried back to the sea. Some of the rain-water, of course, evaporates from the surface of the earth, from rivers and lakes.

Some of the rain-water soaks into the earth and is held in underground basins of impervious rock strata, from where it can be raised by means of wells. Some of this water out-pours from faults in the rock stratum and is available as a spring.

Many towns and cities use water direct from rivers and lakes. London uses the water of the Thames; Glasgow the water of Loch Katrine; Manchester the water of Thirlmere. Under such conditions of supply, very great care has to be taken that pollution is avoided and that there is sufficient purification.

Most local authorities, however, have not a large lake or river to draw upon. They find it necessary to set aside a suitable area in close proximity to the town as a catchment area, or gathering ground, from which the water can be collected and impounded in a reservoir — usually a valley having a dam thrown across it. From here the water is usually — but not invariably — piped by means of a large-sized conduit to a service reservoir on the edge of the town. At this point any needful purification or softening is generally done.

The water from wells and borings is generally hard, i.e. it contains the salts of lime, either calcium carbonate, causing "temporary" hardness which can be removed by boiling, or calcium sulphate, causing "permanent" hardness which cannot be removed by boiling but only by a system of water softening; the base exchange method is typical.

Wells are of three main kinds: shallow, deep, and artesian; the latter being relatively rare in England. The term deep and shallow can be misleading, bearing no relationship to measured depth. It merely means that a "shallow" well only draws water from the subsoil, whilst a "deep" well must penetrate at least one impermeable rock stratum. An artesian well is necessarily a deep well in this sense. The well is bored in the bottom of a rock basin, and the water gushes out, under pressure-head supplied by water in the surrounding hills.

Water Mains. Water mains are those pipes which distribute the water from the reservoir. They vary in size from huge conduits of many feet diameter to fractions of an inch.

Those of concern to the plumber are generally of cast-iron, asbestos-cement, lead, or copper.

Cast-iron pipes of 100, 75 and 500 mm (4, 3 and 2 in.) diameter should be considered. They may be had in lengths varying from 2 to 4 m (6 to 12 ft) and conform to a British Standard specification. A protective coating of a bituminous kind, which is applied whilst the casting is hot, is applied inside and out. Suitable fittings such as bends and junctions are available for use where there is a change of direction or a branch to be made.

Asbestos-Cement and Composition Pipes. During and since the war there has been a great increase in the use of composition pipes. They

are lighter than cast-iron and can be had in correspondingly longer lengths. Like cast-iron, they are treated with a protective coating to prevent the development of vegetal growths. Such growths would by their roughness increase the friction between water and pipe, producing a loss of pressure. Specially designed joints are used on these pipes, which have spigots at both ends and loose collars with rubber rings. A special tool is used to fit the collar and rings in position.

Stop Tap. Immediately inside the house, or any building, a consumer's stop tap should be fitted, so that all cold-water pipes in the building are under quick and easy control. This tap must be of the screw-down type — as must every other hand-operated tap on town's water.

It might be mentioned here that all taps, valves, and cisterns used on water services, including hot-water services and services on meter, must be tested and stamped by the water authorities.

Constant and Intermittent Supply. Most water authorities provide a constant supply of water, but some few find it necessary to intermit supply for various reasons such as inadequacy of mains, capacity and demand at peak periods. This system is known as intermittent supply and for its operation, householders have to have a large storage cistern to cover their needs in periods when the supply stops. The storage cistern may be of cast-iron, slate, galvanised iron, or made of wood and lined with lead or copper. It should be provided with a tray or "safe" in case of leakage — to prevent damage.

Frost Precautions. In England a severe frost always seems to take them by surprise. And their precautions against it are seldom satisfactory.

In general, pipes should be protected from draughts and they should be insulated from outside walls. Under floors and in the roof space of buildings, pipes should be wrapped with canvas backing, hair-felt strip or otherwise covered with a wrapping of spun-glass or any suitable heat-insulating material.

Cisterns exposed to cold air should be boxed in, packed around with insulating material, and fitted with a lid.

It should be noted that a pipe that has been frozen, although it may not burst immediately, will have been greatly weakened and may cause trouble later.

HOT-WATER SUPPLY

Valves. In general, the use of valves should be avoided where possible on hot-water systems. It is useful, however, to place a valve or tap in the cold-water feed pipe immediately under the cistern. It should be a full-way type gate valve providing no impediment to the flow of the water. When this valve is closed, the hot-water supply is immediately stopped, all distribution pipes can be emptied and most repairs can be executed. If it is deemed necessary to control the heating of the hot

water in the cylinder, a valve can be inserted on the return circulator. In no circumstance should two valves be used, otherwise the boiler and pipes will be enclosed and an explosion might follow.

Pipe Sizes. To determine pipe sizes in larger hot-water installations, calculations based on the quantity of hot water needed should be made, although previous experience generally provides satisfactory "rule of thumb" guidance.

Any system providing hot water is known as "domestic"; we must limit our concern to the average small-house installation.

In general, the back-boiler used measures about 250 mm in length, is about 200 mm from back to front, and 150 or 180 mm deep. With an ordinary fire, a boiler of this size provides enough heating surface to keep the cylinder supplied with hot water.

The primary circulation pipes are normally 19 mm diameter lead or copper pipes. They should not be less and, if the cylinder is a large one, 25 mm circulation pipes should be used.

The expansion pipe must be equal in size to the circulation pipes, and is usually 19 mm in diameter.

The cold feed-pipe is often specified as one and a half times the diameter of the largest draw-off. In practice, equally sized feed and draw-off pipes are found to be efficient. In an ordinary house system they are usually both 19 mm in diameter.

There should be no restrictions in the supply pipe to a bath, so that a 19 mm pipe to a 19 mm tap is needed.

The branch drew-off pipes to sinks and lavatory basins are generally 12 mm diameter to 12 mm taps.

The cold-water rising main of 12 mm diameter, being under pressure, is quite capable of replacing the water taken from the supply tank by gravity flow under such low "pressure head".

The overflow pipe and outlet should be sufficiently large to take the full output of the ball tap in case of failure. A 19 mm pipe is mostly used, but a 25 mm diameter overflow would give a more satisfactory margin of safety.

Heating by Hot Water. The term "central heating" applied to the heating of domestic and other buildings indicates that the whole of a building is heated from a central source. Usually an independent boiler, fired by solid fuel, gas, electricity or fuel oil.

The boiler is generally placed at the lowest available point in the building, having regard at the same time to convenience of stoking and delivery of fuel.

Boilers. The boiler may be one of a number of types. It may be a solid one-piece casting, rectangular in form; it may be sectional; or it may be conical in shape and wrought or cast iron. For smaller systems, the first and last-named types are both cheap and suitable. The sectional boiler has the advantage of the possibility of added sections should more heat be needed subsequent to initial installation.

Sectional and shell type boilers are almost invariably used for bigger installations. The former are cast iron and can be built up *in situ*, whilst the latter are usually of the "packaged" type, having all auxiliary components together with the boiler assembled as one unit ready for erection.

Designing a Heating System. In general, a heating system should be designed so that the water will circulate by gravity. In some installations, circumstances are such that a pump or accelerator must be used to achieve a satisfactory circulation. This should be avoided if possible.

When designing a heating system for a large building, it is usual — in the interests of economy and to ensure efficient heating — to first calculate how much heat will be needed to maintain the building at the desired temperature. Then the size of the boiler and the amount of pipe and radiator heating surface required to give out this heat will be estimated. For small systems, "rule-of-thumb" methods and past experience are generally a sufficient guide.

The overhead drop-feed system shows how the hot water from the boiler is carried as high as possible in the building, from where it falls in cooling, through the various branch pipes and radiators, back to the boiler. In this type of system, the maximum amount of "circulating head" or pressure, would be obtained.

Circulating Head or Pressure. In any gravity system of heating (i.e. no pump), circulating head is extremely important. Briefly it is due to the difference in weight of a given volume of water in the flow and return circulators. This factor governs the speed of the circulation, and it should be borne in mind that the rapidity of the circulation will determine the amount of heat which will reach a given radiator.

It will readily be seen that if a pipe were taken from a boiler and carried around a room horizontally and back to the boiler, no circulation would take place — provided the boiler connections were on the same level. If one pipe were connected to the top and the other to the bottom of the boiler, a slow circulation would be found to exist. If instead a pipe leaving the top of the boiler were to be taken to the top of the room, allowed to circulate around the room and return to the bottom of the boiler, a rapid circulation would be evident. This principle should be borne in mind in the design of any heating system.

Most heating installations are a compromise between what is ideal and what is practicable, in consideration of possible pipe runs, radiator and boiler positions, and the shape of any particular building.

There are a few rules which should be observed:

(1) The boiler must be big enough for the job it has to do.

(2) The pipes should be of a size sufficient to convey the volume of water required to give up the needed heat.

(3) Pipe runs should be as direct as possible.

(4) A system should be planned to provide enough heat in the worst possible conditions.

(5) The occupants of rooms should be given a means of controlling the heat output in the room by means of valves.

From the point of view of heat control, one valve only is needed and this can be fixed on either pipe; although in practice it is usually fitted to the return or lower pipe where it is out of the way. It is useful to fit a valve on each pipe so that radiators can be taken out for repair without having to run off the whole of the water in the system.

Erecting and Fixing Boilers. No difficulties exist in the fixing of independent boilers. A good level concrete foundation is needed, and common-sense fire precautions should be observed.

Sectional boilers can be almost any size to as much as 5 or 6 tons in weight. They are usually delivered in separate parts requiring assembly. Heating by hot water is traditionally plumber's work, but in latter years specialist heating engineers have evolved, and it is true to say that larger heating jobs have become mainly their concern. However, a great deal of domestic heating and other smaller systems are carried out by the plumber; some of this work involves the use of sectional boilers.

The stand should be fixed on the level concrete foundation, and it is a good plan to raise the stand either on a course of brick-work or on a concrete curb of similar height. This gives a deeper ash-pit, which allows a considerable accumulation of ashes.

It is advisable to assemble the sections on the floor rather than on the stand, so that it will not get pulled about and maybe damaged. If, however, the boiler is a heavy one, it can be assembled on the stand if care is taken. The front of the stand can be removed for assembly of the front section.

Radiators. Most radiators are sectional; they can be extended and damaged sections can be replaced. A trade catalogue will readily indicate the many different patterns of radiator which can be had.

The majority of radiators have left- and right-hand malleable nipples connecting the sections together. This is a very useful arrangement, but it calls for some care on the part of the dissembler. To remove a section of a radiator, the plugs must first be removed from the ends. Now a special tool, designed to grip the ribs formed on opposite sides of the inside of the nipple, is inserted from the end, the depth to which it must go having already been chalked on it by trial against the outside of the radiator. The air-cock tapping is made on the return end of a radiator, which is left-hand threaded inside. A moment's thought will show that an anti-clockwise turn will screw the nipple out of the left-hand threaded end section and also out of the right-hand second section. Working from the other hand, the reverse will be the case; that is, a clockwise turn should be used.

When assembling radiator sections, the nipples should be cleaned and smeared with a good jointing paste. When coupling up radiators in a heating system, it is most efficient to supply hot water at the top, and take the return water from the bottom at the opposite end. In this way the convection principle is utilised and more positive circulation is obtained.

An air-cock is fitted to each radiator so that pockets of air can be freed. These cocks are used when the system is being filled with water. The usual practice is to let out the air floor by floor, beginning at the lowest. Each air-cock should remain open until water appears, when it can be closed. Periodically the radiators should be freed of air which may have collected at the top. An air-cock is usually fitted with a loose key which fits on to the square end of the spindle.

Sanitary Fittings. Sanitary fittings are those appliances used in the collection and disposal of human and domestic waste products. They comprise commonly: water-closets, lavatory basins, baths, sinks, and urinals.

Baths. Most baths are of vitreous-enamelled cast-iron; they have a square top and are fitted with panels on any exposed sides. There is a growing tendency to use pillar taps instead of the lately common globe-type taps, fixed on the vertical end of the bath. By using pillar taps, the bib or outlet can be raised above the flood rim of the bath, and any danger of water pollution in the service pipes — due to back siphonage — is made less possible. The taps are secured as in a lavatory basin. It is important that before any tap is fixed, the tap top should be removed and reassembled. It often happens that tap tops are abnormally tight, and a lavatory basin or any other fitment might be damaged.

When the tap end of a bath is close to a wall, it is necessary to couple up the farthest tap first, then the overflow, and finally the near tap. Here again a cranked spanner is useful.

The bath waste should be fitted before the bath is lifted into position, and the waste pipe should be in place and complete with trap, so that only a horizontal nut remains to be tightened.

Sinks. As sinks are heavy and are often well loaded, they need good support. In the old days brick pillars were often used, but they are to be deprecated. The support should be such that there is no difficulty in cleaning the wall and floor. For this reason cantilever brackets should be used. Special brackets can be bought, but two pieces of angle- or tee-iron will do admirably; they should be well fastened in the brickwork preferably by building in. For neatness, the brackets should finish about 75 mm from the front of the sink and be cut diagonally. For the same reason, they should be well away from the ends.

The back of the sink should be bedded in cement against the wall, so that the nuisance of water running down the wall is avoided.

Stainless-steel sinks are fitted with pillar taps or mixer units and require the same treatment as lavatory basins. They have a great advantage over glazed earthenware, in that less heat is taken from the water by the sink. This factor removes the need for using an enamel bowl for washing dishes, a practice so common with large earthenware sinks.

Waste Pipes. Waste pipes from lavatory basins, baths, and sinks may be executed in lead (traditional), copper, and cast-iron. Individual

waste pipes should take the shortest path, sharp bends should be avoided, and they should be of such size that they will generally run fairly full, and thereby be self-cleansing.

Lead waste pipes are jointed by means of wiped joints. Whenever lead pipe is used, it should be properly supported to avoid sagging. Copper waste pipes, being more rigid than lead, require less support. Copper tube can be bent to requirement. Cast-iron pipes are sometimes used. They should be of heavy-quality, treated inside and out with a special bituminous solution. The joints should be caulked with tow and lead-wool or molten lead. Waste pipes should be laid to proper falls, and access should be provided in order that each length of pipe can be rodded. Soil pipes are those which convey the contents of water-closets and urinals to the drains. The vent-stack which is normally carried above the roof is also included in any discussion of soil pipes.

The Combined or "One-pipe System". In the "one-pipe system" all sanitary fittings discharge into the same soil pipes with an economy of pipe work, and a simplification of layout. A few precautions need to be taken.

All lavatory basins, baths, and sinks must be fitted with deep-seal traps or with anti-siphonage pipes. The anti-siphonage pipe can be returned into the vent shaft at a point not less than 1 m above the highest soil pipe junction.

The main anti-siphonage pipe must, in certain circumstances, be carried down and connected into the main soil stack below the lowest inlet branch. This precaution is necessary where fittings are situated on two or more floors and discharge into a common stack.

WATER QUALITY PLANNING

The disposal of urban waste water has been a matter of some concern through most of our history but serious efforts at waste water management date from about 100 years ago. For example, the Metropolitan Sanitary District of Chicago was formed in 1880. The first nationwide planning for water quality control was mandated by Congress in 1973. Historically, planning had been limited mainly to the determination of the capacity required in a sewage treatment plant. For this purpose a computation of oxygen sag assuming a steady, low flow was considered adequate. Actually, water quality planning should use techniques of economic analysis and environmental and social evaluation like those used on other water projects. Lack of adequate data on the economic costs of water pollution is a major barrier to economic evaluation. Additionally less than adequate data for developing statements on the probability of various quality conditions further complicates economic evaluation. Similar problems complicate social and environmental comparisons. Thus methodology is available; data are limited; and the concept of evaluation not fully recognized. Methodology for predicting the consequences of various alternative control plans on water quality is still in the development stage.

Examples of good water planning are to be found throughout the past two centuries and, making allowance for some of the constraints imposed on early planners, the good early efforts were probably as well planned as some more recent efforts. Throughout these two centuries examples of poor planning are frequent. Many early failures followed the efforts of "promoters" to bring a project into being with little serious effort at planning. Many examples of this kind of failure can be found in the early history of navigation and irrigation in the United States.

The individual planner is the key factor that determines the success or failure at a project plan. Planners with vision sufficient to recognize the available alternatives and thoughtful enough to conceive of tests by which the best alternatives might be identified, have generally been successful. Planning performed by those who did not understand their mission and attempt a purely mechanical approach to the problem have generally been unsuccessful.

AIR QUALITY STUDY

Foundry Air Quality Study. *(An analysis of existing conditions along with proposals for improving both the air quality and space heating in various foundry buildings.)* Foundries require sufficient ventilation and adequate means to remove the airborne contaminants generated by various processes if industrial hygiene requirements are to be met. Ultimately, the study led to the recommendation that a central boiler plant be constructed to handle the makeup air and space heating loads.

Plant Ventilation. To establish the adequacy of the existing ventilation systems, a thorough visual inspection was made during normal foundry operation. No measurements of air contaminants were taken. Observations gathered by the inspection team were reviewed with foundry personnel to further establish existing conditions. All observations were made during summer operating conditions. Foundry personnel provided needed insight into winter deficiencies.

With the buildings wide open in summer, air flowed through the buildings from space to space in an indeterminant fashion. This created many areas of discomfort and because such random air flow can upset ventilation systems installed to capture contaminants, produced the potential of creating some hazardous areas. To assure satisfactory in-plant environments, it would be essential that total plant ventilation be controlled.

Warehouse. No apparent ventilation problems existed in this area during summer operation. Since no contaminants are generated in the ware-housing operation, there should be no special ventilation requirements in winter. This area should be provided with a balanced or slightly positive air supply to avoid cross-contamination from other areas.

Molding Room. This space was provided with main cooling fans for summer ventilation, and a hood was provided at the line muller. Makeup

air for the hood would have to come from adjacent spaces in winter since none was supplied to the spaces. This would again cause contaminants to move into the molding room, especially from the shake-out area.

Heating Systems. The heating and air conditioning system for the office and comfort facilities areas consisted of three heat pumps and a ducted air distribution system. This system allowed for operation completely separate from the foundry buildings.

The warehouse was heated by a gas fired unit heater, which did not have enough capacity to maintain a satisfactory temperature at outdoor design conditions, especially when trucks were being loaded at the shipping docks. No protection was provided against cold air infiltration during truck loading.

The molding room was heated by a gas fired unit heater hung in the space. No heated outside makeup air was provided at the work stations.

Thermal Insulation. The several buildings comprising the foundry were insulated with various amounts of insulation from none in walls and roofs to $1^1/_2$ in. thick blanket insulation.

1) Building 1, the new foundry, was a prefabricated building constructed as a structural steel frame with sheet metal siding and roof above a poured concrete wall approximately 8 ft above grade. The sheet metal panel walls and roof were insulated with $1^1/_2$ in. thick glass fiber insulation blanket. Roof insulation was exposed aluminum finished plastic covering.

2) Building 2, the original foundry, had concrete block sidewalls and exposed sloping roof without any thermal insulation.

3) Building 3A, the molding room, had concrete block walls and a steel framed sloping roof with no insulation.

4) Building 5, the warehouse, had concrete block walls and metal framed pitched roof. In the office section of this building, ceilings had been installed, and in several rooms wood paneling had been applied to the block walls.

Air Quality Improvement. Systems were proposed to improve our quality, summer and winter, in each area of the foundry included in the study. The recommended systems included high levels of ventilation for summer relief cooling and heating for winter conditions. The proposed systems reflected the following considerations:

Capture of contaminants at their sources of generation is the most effective from the viewpoint of industrial hygiene and the least expensive in terms of energy.

Certain exhaust gas streams may be returned to work spaces after removal of particulate matter. This permits effective exhaust system operation without the cost (energy) burden of heating makeup air. When processes generate gases or vapors injurious to health, recirculation must be avoided.

Temperature control systems would be designed to minimize energy consumption through reduction of outside air when the spaces were unoc-

cupied and to be responsive to useful heat gains from cooling hot molds.

Heat Recovery Vs. Economizer Cycle. *(Some insights to aid you in the complex evaluations required to determine whether one or the other, or a combination, will be most cost effective in a given situation.)* With the great emphasis on energy conservation today, architect-engineer teams in the building construction industry are constantly striving to design buildings and their air conditioning systems to consume the least amount of energy.

Energy can be conserved by designing well insulated and shaded building envelopes that have minimum heat gains and losses. Non-depleting energy sources can be used to conserve depletable energy sources. Energy can also be conserved by choosing the appropriate energy conserving air conditioning systems.

Characteristics of the Systems. One popular form of heat recovery in building air conditioning is the use of the refrigeration cycle to "pump" rejected heat from spaces requiring cooling to those requiring heating. When rejected heat exceeds the heating load, the excess heat is rejected to the atmosphere through a cooling tower or air cooled condenser. With this scheme, as long as there is rejected heat to satisfy the heating needs, the heat is considered free.

Both refrigeration cycle heat recovery and the economizer cycle are designed to conserve energy. The concepts of these two energy conservation schemes are basically not compatible, however. The economizer cycle saves cooling energy. It is most effective when the refrigeration plant is shut down. On the other hand, the heat recovery scheme saves heating energy, and it relies on the operation of the refrigeration plant to transfer the rejected heat to satisfy the heating needs.

In reality, however, refrigeration cycle heat recovery and the economizer cycle can be used harmoniously in a building air conditioning system to obtain maximum operating economy.

Depending on the location and the type of building, the availability of energy sources may vary. Under different conditions, coal, oil, natural gas, propane and electricity can all be considered as primary energy sources. Where two energy sources are available, such as gas and electricity, the costs of the sources will influence the choice of systems.

There are no simple rules for deciding what energy conserving scheme should be used in a given building. The evaluation process can be so complex that computer programs may be needed to help speed up what otherwise would be an almost impossible task. In such cases, the engineer should recognize that because of the complexity involved, he must have a complete understanding of, and agreement with, the algorithms used in the computer programs to be able to claim that he, not the author of the program, performed the evaluation.

DAMS

The first dam for which there are reliable records was built on the Nile River sometime before 4000 B.C. It was used to divert the Nile

and provide a site for the ancient city of Memphis. The oldest dam still in use is the Almanza Dam in Spain, which was constructed in the sixteenth century. With the passage of time, materials and methods of construction have improved, making possible the erection of such large dams as the Nurek Dam which has been constructed in the USSR on the Vaksh River near the border of Afghanistan. This dam is 333 m high, of earth and rock fill. The failure of a dam may cause serious loss of life and property; consequently, the design and maintenance of dams are commonly under government surveillance.

Types of Dams. Dams are classified on the basis of the type and materials of construction, as gravity, arch, buttress, and earth. The first three types are usually constructed of concrete. A gravity dam depends on its own weight for stability and is usually straight in plan although sometimes slightly curved. Arch dams transmit most of the horizontal thrust of the water behind them to the abutments by arch action and have thinner cross sections than comparable gravity dams. Arch dams can be used only in narrow canyons where the walls are capable of withstanding the thrust produced by arch action. The simplest of the many types of buttress dams is the slab type, which consists of sloping flat slabs supported at intervals by buttresses. Earth dams are embankments of rock or earth with provision for controlling seepage by means of an impermeable core or upstream blanket. More than one type of dam may be included in a single structure. Curved dams may combine both gravity and arch action to achieve stability. Long dams often have a concrete river section containing spillway and sluice gates and earth or rock-fill wing dams for the remainder of their length.

The selection of the best type of dam for a given site is a problem in both engineering feasibility and cost. Feasibility is governed by topography, geology, and climate. For example, because concrete spalls when subjected to alternate freezing and thawing, arch and buttress dams with thin concrete sections are sometimes avoided in areas subject to extreme cold. The relative cost of the various types of dams depends mainly on the availability of construction materials near the site and the accessibility of transportation facilities. Dams are sometimes built in stages with the second or later stages constructed a decade or longer after the first stage.

The height of a dam is defined as the difference in elevation between the roadway, or spillway crest, and the lowest part of the excavated foundation. However, figures quoted for heights of dams are often determined in other ways. Frequently the height is taken as the net height above the old river bed.

Construction of Arch Dams. The foundation of an arch dam must be stripped to solid rock and the abutments should be stripped and excavated at approximately right angles to the line of thrust to prevent sliding of the dam. Seams and pockets in the foundation and abutment are grouted in the usual manner. Since the cross section of an arch dam is relatively thin, care must be taken in the mixing, pouring, and curing

of the concrete in order to secure adequate resistance to seepage and weathering. Concrete is placed in a manner similar to that for gravity dams, usually in 3-m lifts, although 6-m lifts are not uncommon at the upper levels, where the section is quite thin. A layer of mortar is usually placed between lifts to ensure better bond. Small arch dams have radial and horizontal construction joints, while large arch dams have circumferential joints as well. All joints must have keyways, and water stops must be provided to prevent leakage. To minimize temperature stresses, the closing section of the dam is poured only after the heat of setting in the other sections is largely dissipated.

Buttress Dams. A buttress dam consists of a sloping membrane which transmits the water load to a series of buttresses at right angles to the axis of the dam. There are several types of buttress dams, the most important ones being the flat slab and the multiple arch. These differ in that the water-supporting member in one case is a series of flat reinforced-concrete slabs, while in the other it is a series of arches which permit wider spacing of buttresses.

Buttress dams usually require only one-third to one-half as much concrete as gravity dams of similar height but are not necessarily less expensive because of the increased formwork and reinforcing steel involved. Since a buttress dam is less massive than a gravity dam, the foundation pressures are less and a buttress dam may be used on foundations which are too weak to support a gravity dam. If the foundation material is permeable, a cutoff wall extending to rock may be desirable. The upstream faces of buttress dams usually slope at about 45°, and with a full reservoir a large vertical component of hydrostatic force is exerted on the dam. This assists in stabilizing the dam against sliding and overturning. The first reinforced-concrete slab and buttress dam was built in the USA by Nils Ambursen in 1903, and this type of dam is often called an *Ambursen dam.*

The height of a buttress dam can be increased by extending the buttresses and slabs. Consequently, buttress dams are often used where a future increase in reservoir capacity is contemplated. Powerhouses and water-treatment plants have been placed between the buttresses of dams with some saving in cost of construction.

Construction of Buttress Dams. Removal of overburden down to a suitable foundation and excavation of a trench for the cutoff wall are the first steps in the construction of buttress dams. Great care must be taken in the construction of forms, handling of concrete, and placing of reinforcing steel in order to develop fully the strength and watertightness of the thin sections used in buttress dams. Deck and buttresses are placed in lifts of 3.5 m or more, the buttress construction being kept well in advance of the deck. Keyways are required in all construction joints. Since buttress dams require much less concrete than comparable gravity dams, the time for construction is usually less and the problem of water diversion somewhat simplified.

Earth Dams. Earth dams (earth-fill and rock-fill types) utilize natural materials with a minimum of processing and may be built with primitive equipment under conditions where other construction material would be impracticable. It is not surprising that the earliest known dams were of earth. Modern developments in earth-moving equipment have resulted in decreased cost for earth moving as compared with an increase in cost of concrete as a result of increased wage and material costs. Earth dams are now competitive in cost with concrete in all sizes. The design of earth levees and dikes follows the same principles as for earth dams. Some of the larger earth-fill and rock-fill dams are listed in the table given below.

Large Earth-Fill and Rock-Fill Dams

Name	Country	Volume, 1000 m	Height, m	Length, m	Top width, m	Year completed
Earth-Fill type						
Nurek	USSR	54,100	310	730	. . .	1977
Balderhead	England	2,300	51	925	. . .	1965
Cobble Mt.	USA	1,380	75	244	15	1936
Rock-fill type						
Akosombo	Ghana	8,000	142	640	. . .	1965
Salt Springs	USA	2,300	99	400	4.6	1931
Akersvatn	Norway	1,100	50	500	. . .	1968
Composite rock-fill and earth-fill types						
High Aswan	Egypt	42,500	111	3830	. . .	1972
Keban	Turkey	15,000	207	1100	. . .	1971

Unlike high-arch and gravity dams, which require a sound rock foundation, earth dams are readily adapted to earth foundations. They are logical choices for many sites where foundation conditions make concrete dams unsatisfactory. It should not be assumed that the construction of earth dams is a simple operation and that their design requires little more than rule-of-thumb criteria. Numerous failures of poorly designed earth embankments make it apparent that earth dams require as much engineering skill in their conception and construction as any other type of dam. In no other type of dam are the construction and design procedures so interdependent; continuous field observations of deformations and pore-water pressures are often made during the construction period to evaluate the initial design. Modifications of design on these observations are not uncommon for large earth dams.

Methods of Construction. Earth dams are most commonly constructed by the rolled-fill method. The procedure is to place selected material in layers of 15 to 45 cm and compact them with a heavy roller. Some compaction may be obtained by proper routing of trucks and other construction equipment. Usually, however, special equipment is used for compacting the fill. Both sheepsfoot rollers and heavy pneumatic-tired rollers are used singly or in combination. Ordinary road rollers have been used successfully on small projects. In any case the material should be placed at a moisture content near that for optimum density. Coarse gravels are not suited for compaction by rolling, but vibrating equipment can be used.

In past years a number of earth dams were constructed by hydraulic-fill methods wherein water was used to transport the material to its final position in the dam. Because of lack of control in placing the material, there were many failures of this type of dam and construction by hydraulic-fill methods is not recommended.

Design of Earth Dams. The design of an earth dam consists in developing a fill of sufficiently low permeability for the intended purpose out of available materials at minimum cost. Borrow for the fill must usually be close to the site because of the high cost of long truck hauls. Since quantity of fill varies approximately with the square of the height, earth-fill dams of great height are rare.

The structural design of an earth dam is a problem in soil mechanics involving assurance of stability of the fill and foundation and sufficient control of the water flow and seepage pressures. There is little harm in seepage through a flood-control dam if the stability of the embankment is not impaired, but a conservation dam must be as watertight as possible. It is difficult to analyze the probable behavior of natural fill materials in a zoned embankment with the assurance attained in the design of concrete structures. Present design practice is to conform with existing dams of similar characteristics with analytical checks on the adequacy of the dam under special conditions. Empirical rules are frequently employed for the preliminary design of large dams and for the final design of small dams. Fill quantities in dams under 5 m high are so small that a considerable excess factor of safety can be provided at low cost.

TYPES OF BUILDINGS

A 45-Story Apartment Building. A 45-story apartment building located in Edmonton, Canada, provided testimony to the savings achieved by the use of structural lightweight concrete. A price comparison between the cost of a prestressed flat plate floor system designed in normal-weight concrete, and the same system designed in structural lightweight concrete came out significantly in favor of lightweight concrete.

The irregular shape and steep slope of the site led to the hexagonal plan used for all floors in the 0.5 million sq ft structure. Location of the tower — 402 ft in overall height — at the base of an embankment led

to the use of the lower 11 stories to serve as a 357 car capacity parking area with spiral ramp.

The 12th floor, which provides access to the top parking level, is a large mezzanine with a swimming pool, game room, bar and offices. A unique entrance to the main level — which varies in elevation from 36 to 60 ft above the sloping ground surrounding the tower — is afforded by a bridge from top of the embankment. This bridge spans a major traffic artery. Two additional entrances are located at the middle and bottom parking levels. The top 34 floors of the tower are used for suites, offices, a large lobby area, and a restaurant.

All floors are $7^1/_2$ in. thick, and span distances of 25 and 31 ft. These flat plates are of structural lightweight concrete, specified at a 4-day compressive strength of 2,500 psi to allow post-tensioning at that age. Some 11,0000 cu yd of structural lightweight concrete were placed. A total of 15,000 lightweight concrete masonry units were also used for partitioning.

The fireproof quality of structural lightweight concrete was illustrated midway through construction when the canvas hoarding — used to protect both workmen and the concrete from the elements — caught fire. It was reported that no signs of distress whatever were shown in core samples taken from the concrete after the blaze.

A Two-Story Chemistry Building. The Chemistry Building at the University of Nevada, Las Vegas, received the Honor Award for Excellence in Architectural Design at the Western Mountain Region Convention of the American Institute of Architects.

The two-story reinforced concrete building is split-level designed with 47,000 sq ft. Perimeter access is at existing grade with the central core of the building set 4 ft into ground. The split-level concept eliminates vibration transfer between laboratory functions, provides additional insulation, and minimizes the vertical travel for physically handicapped students and faculty.

The central core of each floor contains four general undergraduate teaching laboratories with faculty offices, administration, stockrooms, teaching stations, the library, and specific teaching and research laboratories forming perimeter envelopes about each core.

The interior of the building was lightly sandblasted and clear silicone sealed.

A Method That Made Higher Buildings Possible. Louis Sullivan was the "father" of modern architecture in the United States of America. He designed buildings with new ideas that have shaped American architecture since his time. He disapproved of classical stone columns and sculpture because they disguised buildings that were beginning to be constructed essentially of metal.

Up until one hundred years ago, the height of a building was limited by the amount of weight the walls could carry. High buildings required very thick masonry walls, which took up valuable inside floor space.

New methods, devised at the end of the 1890's, made use of metal

beams and columns encased in masonry or concrete. The beam supported only the single story that rested upon it, and therefore the wall could be very thin. The weight passed to the end of each beam and was carried downward by the vertical columns to which the beams were attached. This method made higher buildings possible.

The Prudential Building, Buffalo, New York, was designed by Sullivan. The lines of the first two stories are strongly horizontal, suggesting a firm foundation for the building that rises ten stories. The windows are divided by slender, continuous bands that suggest columns supporting the floors. Flat ornamentation, invented by the architect, enriches but does not hide the structure. This is not the first building of its kind, but from such construction the skyscraper was born.

A Means of Providing Cheaper Houses. British architects and civil engineers are now considering a means of providing cheaper houses on a scale that could go far in solving the housing problem. It is known that in Britain there are over 4,000 miles of railway lines. With imaginative planning this land could provide space for nearly 2,000,000 flats and similar living units. In addition, there are over 800 miles of disused canals, and an unknown mileage of disused roads, that could similarly be used for housing development.

The idea of building over and along former lines of communication would save an average of about 15 per cent in total building costs, and a further 5 per cent by eliminating much land clearance and earth removal. And where the lines have not already been ripped up, rail wagons could be used for transporting labour and materials. Such advantages could save 10 per cent in time and labour costs.

With this type of building half the total mileage lines available would provide 1,250,000 living units. The other half could be used to ensure plenty of open space between groups of buildings.

One objection to building along railway lines is that it would be monotonous.

A FEW WORDS ABOUT SOVIET ARCHITECTS

A Talented Soviet Architect. Aleksei Viktorovich Shchusev is known as a brilliant Soviet architect. He has built scores of remarkable buildings, worked out over 150 designs, published about 170 scientific papers, created a great number of drawings and paintings. The name A. A. Shchusev stands in the history of architecture alongside the names of such talented Russian architects as V. Kazakov and V. Bazhenov.

One of A. V. Shchusev's first designs was that of the Kazan Terminal in Moscow. The composition of the terminal is quite interesting: several separate pavilions are joined by the architect into one building, and are subordinated to the clear-cut vertical lines of the main tower. The pavilions of the terminal are also joined together by forms taken from 17th century Russian national architecture.

The interiors of the terminal have been designed by the architect in the Russian national style; here one can see the cubic space of the

waiting halls, the mighty arch lines, the typical shape of the window openings.

The Kazan Terminal was being created during the trying years of the rehabilitation of the national economy (1918-1926). The finishing touches to the terminal were resumed in 1940.

It should be noted that a characteristic trend in Shchusev's creative work as an architect is his ability to make full use of national motifs. His bold use of red bricks and white stones as building material was especially to the liking of ancient Russian architects.

Soviet Architects Are Active Builders of Communism. When designing industrial enterprises, architects working in the field of industrial construction, widely introduce methods of typification, and seek new planning solutions corresponding to the demands of modern organization of industrial processes. They are beginning to give serious attention to the architecture of an industrial interior, making use of the achievements of technical aesthetics and designing.

The progress of Soviet architecture of late has found its effect on the wide public recognition received by outstanding town-building ensembles and separate constructions.

Lenin and State Prizes were awarded to the creators of the Lenin Memorial in Ulyanovsk, the Victory Monument in Volgograd, the Ostankino TV tower in Moscow, the memorial complexes at Khatin in Belorussia, and "Salaspils" in Latvia which are dedicated to the victims of fascism, the V. I. Lenin "Artek" pioneer camp in the Crimea, the building in the Uzbek city of Navoye, the K. Tsiolkovsky Museum in Kaluga, the Bratsk HPS, the Novosibirsk Academic Town, the Pioneer Palaces in Moscow and Kiev, and many others.

For the first time the USSR State Prize was awarded for the architecture of a new residential area — the Zhirmulai District in Vilnius. In 1971 the creators of several rural settlements were awarded USSR State Prizes.

Real international brotherhood of the peoples of the Soviet Union was demostrated in the rebuilding of Tashkent after the 1966 earthquake which partly destroyed the capital of Uzbekistan. In its rebirth the architects of Moscow, Leningrad, the Ukraine, the Baltic Republics, Central Asia, and other republics and regions of the country took an active part.

One cannot help noting the inspired work of architects, sculptors and artists in immortalizing the events and the heroes of the Great Patriotic War. In many towns and cities of the country remarkable memorials have been constructed.

Such Soviet architects as A. Adylov, V. Atayev, V. Balchunas, V. Ginzburg, V. Krasilnikov, O. Ladigina, V. Nesterov. E. Rozanov and others have become recognized masters of architecture.

Serious research in the field of the theory of architecture has contributed to the active development of architectural creative work. It is necessary to mention the names of the following architects-scientists who introduced quite a lot in the development of theoretical problems

of architecture: L. Avdotin, M. Barkin, V. Belousov, A. Bunin, A. Zhuravlev, K. Ivanov, A. Ikonnikov, L. Kirillova, and others.

Considerable creative achievements have been gained by such architects as A. Babakhanov, N. Baranov, V. Elizarov, B. Iofan, V. Kamensky, A. Kurdiani, G. Orlov, M. Posokhin, V. Simbirtsev, S. Speransky, N. Ullas, M. Useinov, I. Fomin, and others. The title of Honoured Architect of the Republic has been conferred upon many masters of architecture.

At the 25th and 26th CPSU Congresses the necessity to raise the quality of residential construction was emphasized. Housing construction in the current five-year period will continue to expand.

Designers, builders and workers in the house-building industry are doing their best to sucessfully solve one of the most important social problems — the provision of Soviet people with comfortable flats. Beneficial results have already been achieved in this respect. However, the quality of construction on a mass scale does not yet fully meet the strict requirements of the day. The quality of architecture is closely linked with the quality of building. Therefore, raising the quality of mass building should be the concern of both the architects and the builders.

An effective way of overcoming the monotony of mass housing is to raise the quality of architectural planning of dwelling houses and cultural and welfare facilities. This can be achieved by making greater use of the environment while planning residential districts. Two new towns can be shown as such an example: Sosnovy Bor near Leningrad (Architects M. Bely, U. Savchenko, B. Mashin and others), and Zelenograd near Moscow (Architects I. Pokrovsky, A. Klimochkin, F. Novikov and others).

The problem of synthesizing architecture and monumental art in building modern cities, in the formation of their ideological and artistic image and their ensemble has of late received great significance.

The works of Soviet town-builders on the planning and building of new towns are winning international recognition. In 1976 the International Architect's Union awarded the P. Abercromby Prize to the architects I. Orlov and N. Simonov for the architecture of the new towns of Navoye and Shevchenko, which were built in difficult desert conditions.

ГРАММАТИЧЕСКИЙ СПРАВОЧНИК

§ 1. Структура предложения (The Structure of the Sentence). В английском языке, как и в русском, пять членов предложения. Они подразделяются на главные и второстепенные. К главным членам предложения относятся: подлежащее (1) и сказуемое (2), к второстепенным — дополнение (3), обстоятельства (0), (4), и определение.

Подлежащее (Subject) может быть выражено существительным, местоимением в именительном падеже, прилагательным (**The young** go in for different kinds of sports); числительным (**Five** and **seven** make twelve); герундием (**Smoking** is harmful to a person's health); инфинитивом или инфинитивной группой (**To come to a construction** site and **to learn the trade of a builder** is very important for our students).

Сказуемое (Predicate) может быть простым, составным именным, составным глагольным (модальным или видовым). Простое сказуемое выражается глаголом в личной форме, в любом времени, залоге и наклонении. Составное именное сказуемое выражается глаголом-связкой в сочетании с именной частью. Глаголом-связкой часто является глагол **to be**, который указывает на наличие признака или состояния. В качестве глагола-связки употребляются также глаголы **to grow, to get, to become, to turn, to keep, to remain, to feel, to appear, to seem.**

Определение (Attribute) стоит или перед определяемым членом предложения (обычно существительным), или после него. В первом случае оно называется левым определением, а во втором — правым.

Левое определение может быть выражено:

— прилагательным, местоимением, существительным в притяжательном падеже: **My sister's** room is not large.
— существительным без предлога: The **building** institutes attract large numbers of young people.
— числительным: The builder's flat consisted of **three** rooms.
— причастиями I и II: A **moving** object was seen far away in the distance. It was an interesting and well **illustrated** lecture.

Правое определение может быть выражено:

— существительным или герундием с предлогом: There are all kinds **of roofing**.
— инфинитивом: The laboratory **to be situated** on the ground floor will be rather spacious.
— причастиями I и II: The person **entering** the profession of a civil

engineer must have a scientific attitude, initiative and imagination. The project **designed** by our architects was approved by the commission.

— придаточным бессоюзным предложением: The diploma project **she has defended** is very interesting.

Обычно сказуемое (2) следует за подлежащим (1). Такой порядок слов называется прямым: The builders are now at the construction site. При обратном порядке слов сказуемое находится перед подлежащим: **Are** the builders now at the construction site?

Из примеров видно, что в английском языке повествовательное предложение начинается с подлежащего (1), т.е. с указания лица или предмета, которое совершает действие. За подлежащим следует глагол в личной форме — сказуемое (2): The new architect (1) **has come** (2).

Дополнение (object) обычно стоит после сказуемого и выражается:

— существительным: A sanitary engineer protects **the quality** of water.

— местоимением: He gave **her** all the necessary information about the new construction site.

— инфинитивом: This student wants **to master** the profession of a welder.

— герундием: They prefer **speaking** in low voices.

— придаточным дополнительным предложением: She wrote that **she would go to Bratsk.**

Прямое дополнение (Direct Object) отвечает на вопросы **whom**? *кого*? и **what**? *что*? и не имеет перед собой предлога.

Косвенное дополнение (Indirect Object) отвечает на вопросы **to whom**? *кому*? и употребляется как с предлогом, так и без него: The constructor showed **us** a new plan. The constructor showed a new plan **to us.**

Предложное дополнение обычно отвечает на вопросы **with whom**? *с кем*?, **about whom**? *о ком*?, **about what**? *о чем*? и т. д. He mentioned a few words **about it.**

Основные типы обстоятельств (Adverbial Modifiers) следующие: обстоятельства времени, места, образа действия, причины, цели, обстоятельства сопутствующих явлений. Обычно обстоятельства занимают в предложении нулевое (0) или четвертое (4) место. В том случае, если обстоятельства выражены наречиями, они могут предшествовать сказуемому, стоять после него или после вспомогательного глагола: The students *usually* started their work in the morning. They worked *silently* thinking about their new structure.

Обстоятельства могут быть выражены:

— герундием с предлогом: **After coming home** he began to read.

— причастием I с дополнением: He read the book **paying attention to the style.**

— независимым причастным оборотом: Each **dwelling area having its own characteristics,** their appearance is quite different.

— инфинитивом с дополнением: **To provide full protection against overheating in summer,** the window is insulated.

В английском языке члены предложения употребляются в строго определенной последовательности; изменение порядка слов приводит к изменению смысла предложения.

В утвердительном предложении члены предложения расположены таким образом:

(0) Обстоятельство	(1) Подлежащее	(2) Сказуемое	(3) Дополнение	(4) Обстоятельство
Last year	builders	assembled	blocks of flats.	
	Builders	will assemble	blocks of flats	next year.

Когда второстепенные члены отсутствуют, предложение называется простым нераспространенным: Builders build. При наличии второстепенных членов предложение называется простым распространенным: Builders create new methods of stone cutting. По расположению членов предложения можно определять функцию любого слова, что необходимо для чтения научно-технической литературы по специальности.

§ 2. Вопросительные предложения (Interrogative Sentences).

Is she a doctor? **Is** there a block of flats under construction in N. Street? **Does** he go in for sports? **May** I come in? **Have** you a sister? **Can** builders do without cranes nowadays? **Have** they already translated the article?

Как видно из примеров, в начале вопросительных предложений находятся глаголы **to be, to have**, вспомогательные или модальные глаголы. Подобные вопросы, которые задаются с целью получить утвердительный или отрицательный ответ, называются общими вопросами.

В том случае, если вопрос относится только к одному члену предложения, он является специальным. В вопросительных предложениях такого типа за вопросительным словом следует вспомогательный глагол: **When** *do* they start their work at a major construction site? (вопрос к обстоятельству времени); **What** *does* she read? (вопрос к дополнению); **What books** *does* she read? (вопрос к определению).

При вопросе к подлежащему за вопросительным словом следует глагол в утвердительной форме: **Who** *came* to the hostel yesterday? **Who** *looks* after your children? **What** *has been modernized* at this construction site?

Если в конце вопросительного предложения стоит предлог, то он относится к вопросительному слову: **What** is the beaver characterized **by**?

Вопрос с союзом **or** *или* является альтернативным, представляющим собой соединение двух общих вопросов: Will you live in a six-storey house **or** will you live in a nine-storey house?

В том случае, если вопрос состоит из утвердительного

предложения и последующего краткого вопроса, он называется разделительным и обычно соответствует русскому вопросу с оборотом «не правда ли»?: Nine-storey blocks with hotel-type service **are intended** for small families, *aren't they*? (говорящий ожидает утвердительного ответа). Если утвердительное предложение употребляется в отрицательной форме, глагол в кратком вопросе употребляется в утвердительной форме: Nine-storey blocks with hotel-type service **are not intended** for large families, *are they*? Подобный вопрос также соответствует русскому вопросу с оборотом «не так ли?», «не правда ли?».

§ 3. Сложные предложения. Части сложносочиненного предложения (Compound Sentence) соединяются сочинительными союзами **and** *и*, **but** *но*, **as well as** *так же, как и*, **either** ... **or** *или* ... *или* и т.д.), перед которыми могут стоять запятые.

Сложноподчиненное предложение (Complex Sentence) состоит из главного и одного или нескольких придаточных предложений (Clauses), зависимых от главного. Придаточные предложения присоединяются к главному при помощи подчинительных союзов, союзных слов и без союза: Kitchens are provided in some of the four-person flats **where** a sliding screen separates the dining area.

Знак препинания между главным и придаточным предложениями обычно отсутствует.

В зависимости от места и выполняемой функции в сложноподчиненном предложении различают следующие виды придаточных предложений: 1) Придаточные предложения-подлежащие; 2) Придаточные предложения-сказуемые (предикативные члены); 3) Дополнительные придаточные предложения; 4) Определительные придаточные предложения; 5) Обстоятельственные придаточные предложения.

Союз **that** *что*, присоединяющий дополнительные придаточные предложения к главному, часто опускается. Однако при переводе на русский язык союз *что* ставится между сказуемым главного и подлежащим придаточного: Unfortunately, some students believe it is not necessary to study every day. К сожалению, некоторые студенты считают, *что* заниматься ежедневно — не обязательно.

В определительных придаточных предложениях союзное слово **(that, which, whom)** может быть опущено в том случае, если оно не является подлежащим придаточного предложения. При переводе на русский язык между подлежащим главного предложения и подлежащим придаточного предложения следует употреблять союз *который*: Materials used for structural purposes should meet several requirements. Материалы, *которые* употребляются для строительных целей, должны удовлетворять нескольким требованиям.

§ 4. Предложения с подлежащим it. Безличные предложения в английском языке отличаются от соответствующих русских предложений тем, что в них всегда имеется подлежащее, выраженное мес-

тоимением **it**, которое на русский язык не переводится: **It** is difficult. — Трудно.

В предложениях с усилительной конструкцией **It** is + существительное + **that (who)** местоимение **it** и союз **who** обычно не переводятся: **It** is precast reinforced concrete **that** has permitted the high scale of construction in our country. *Именно* сборный железобетон обеспечил высокий размах строительства в нашей стране. **It** was Rastrelli **who** created the monumental structure in Kiev. *Именно* Растрелли создал монументальное сооружение в Киеве.

В предложениях с подлежащим **one**, неопределенное местоимение **one** или переводится словами *всякий*, *каждый* или совсем не переводится: **One** must know that Portland stone is one of the best known and strongest stones in England. Необходимо знать ... . *Каждый* должен знать ... .

Предложения, подлежащим которых являются отрицательные местоимения **no one, nothing, nobody,** переводятся на русский язык с двумя отрицаниями: **Nothing** is more convenient than built-in furniture. *Нет ничего* более удобного, чем встроенная мебель.

§ 5. Предложения с оборотом there + to be. В обороте **there + to be** слово **there** теряет свое основное значение наречия *там*. Подлежащее в таких предложениях стоит после сказуемого. Перевод предложений следует начинать с обстоятельства места или сказуемого: **There was** important information in the journal article. *В журнальной статье* содержалась важная информация. **There were** a lot of methods to choose from. *Существовал* большой выбор методов.

§ 6. Многозначность слов и значение слова в предложении. Для установления значения слова необходимо определить, какой частью речи оно является и какую функцию выполняет в предложении: The **cost** (подлежащее) of the new building combine is reduced. It now **costs** (сказуемое) much less than it did several years ago. The more insulation we provide, the more the building structure **costs** (сказуемое).

§ 7. Определение существительного (Noun) в предложении. Показателями, помогающими найти существительное в предложении, являются:

1) формы единственного и множественного числа;
2) падежные отношения;
3) артикли **a (an), the**;
4) словообразовательные суффиксы существительных;
5) притяжательные местоимения: **my, your, his, her, its, our, their**; указательные местоимения **this, that, these, those**; неопределенные и отрицательные местоимения;
6) прилагательные (her **new** friends);
7) причастия (the **growing** city);
8) числительные (the **first** meeting);
9) левое определение и правое определение.

§ 8. Образование множественного числа существительных. 1. После шипящих и свистящих звуков [s], [ʃ], [ʒ], [tʃ], а также после [z] и [dʒ] суффикс -(e)s произносится как [ɪz]: house — houses [zɪz], bridge — bridges [-dʒɪz], match — matches [-ɪz], box — boxes [-ɪz].

Если основа слова в единственном числе оканчивается на **-o**, во множественном числе к ней прибавляется суффикс **-(e)s**, который произносится как [z]: hero — heroes.

Если основа оканчивается на **-y** с предшествующим согласным, во множественном числе к ней прибавляется суффикс **-e(s)**. Буква **y** переходит в **i**: library — libraries, property — properties, capacity — capacities, necessity — necessities.

Если основа слова в единственном числе оканчивается на **-f(fe)**, буква **f** при прибавлении к ней суффикса множественного числа меняется на **v**: life — lives.

Форма множественного числа некоторых существительных образуется изменением гласных в основе слова (без прибавления суффикса): a man [mæn] — men [men]; a foot [fut] — feet [fi:t]; a tooth [tu:θ] — teeth [ti:θ]; a child [aɪ] — children [ɪ].

2. Следует запомнить формы единственного и множественного числа следующих существительных:

Единственное число (Singular)	*Множественное число (Plural)*
axis ['æksɪs] *ось*	**axes** ['æksɪ:z] *оси*
basis ['beɪsɪs] *основа*	**bases** ['beɪsɪ:z] *основы*
crisis ['kraɪsɪs] *кризис*	**crises** ['kraɪsɪ:z] *кризисы*
datum ['deɪtəm] *данная величина*	**data** ['deɪtə] *данные*
index ['ɪndeks] *индекс*	**indices** ['ɪndɪsɪ:z] *индексы*
phenomenon [fɪ'nɔmɪnən] *явление*	**phenomena** [fɪ'nɔmɪnə] *явления*
nucleus ['nju:klɪəs] *ядро*	**nuclei** ['nju:klɪaɪ] *ядра*

При названии одного предмета (лица), существительное употребляется в словарной форме: a house, a bus, an engine, an engineer, a box, a body.

При приведении существительных к словарной форме суффикс **-(e)s** опускается после **ss, x, zz, sh, ch, o:**
passes — pass; buzzes — buzz, taxes — tax; switches — switch, heroes — hero; после буквы **v**, которая в большинстве случаев переходит в **f:** knives — knife: leaves — leaf.

Некоторые существительные имеют в единственном числе окончание **-s** и не имеют формы множественного числа: mathematics, physics, aerodynamics, politics.

У ряда существительных — одна и та же форма для единственного и множественного числа: **news** — *новость, новости;* **information** — *сведение, сведения;* **knowledge** — *знание, знания;* **aircraft** — *самолет, самолеты* (авиация).

Слово **work** выражает два понятия. Когда оно употребляется в единственном числе, оно выступает в значении «работа», во множественном числе оно обозначает «завод».

§ 9. Показатели единственного и множественного числа существительных. Показателями единственного числа существительных являются: неопределенный артикль: **a** means — *средство;* указательное местоимение в единственном числе: **this** means — *это средство;* прилагательные **each, every: each** basis; неопределенные местоимения **much, many** — *много,* **little** — *мало;* **few** — *мало;* **some** — *какой-нибудь, некоторый, несколько;* **any** — *любой, какой-нибудь;* **other** — *другой;* **another** — *другой;* **no** — *никакой, ни один;* **either** — *любой* (из двух); **neither** — *ни тот, ни другой;* **What?** — *какой?;* **Whose?** — *чей?;* **Which?** — *который?*

§ 10. Показатели рода существительных. Грамматический род у существительных в английском языке отсутствует. Существительные одушевленные в зависимости от пола соотносятся с местоимениями мужского или женского рода: mother, sister, waitress, actress — **she,** father, brother, waiter, actor — **he.**

Существительные, обозначающие неодушевленные предметы, абстрактные понятия и явления, соотносятся с местоимениями среднего рода: lecture, discovery — **it.**

Названия судов, небесных светил и стран соотносятся с местоимением **she:** a ship, the Moon, Italy — **she.**

§ 11. Показатели падежей существительных. В английском языке существует всего два падежа: общий и притяжательный.

На общий падеж существительных как в единственном, так и во множественном числе указывает нулевой падежный суффикс (0): **scientist⁰, scientists⁰.** В зависимости от места в предложении, существительное в общем падеже передает отношение, выражаемое в русском языке существительным в именительном, винительном и дательном падежах: The **scientist** solved a new **problem.** The **engineers** asked the **scientist** many **questions.** The **engineers** gave the **scientist** a new **idea.**

Падежные суффиксы **'s** и **(')** являются признаком притяжательного падежа существительных:

Общий падеж *(кто? что?)*	**Притяжательный падеж** *(кого? чей?)*
Существительные с нулевым суффиксом:	Существительные с суффиксом **'s** (в единственном и во множественном числе)
student *студент*	student's, students' } *студента, студентов*
child *ребенок*	child's, children's } *ребенка, детей*
The **student's** book	Книга *(чья?)* студента
The **child's** ball	Мяч *(чей?)* ребенка
The **scientist's** invention	Изобретение *(чье?)* ученого
The **children's** room	Комната *(чья?)* детей
The **students'** marks	Оценки *(чьи?)* студентов

В притяжательном падеже существительные, обозначающие меры длины, времени, веса и т.д. переводятся: существительным с предлогом; существительным со словом «равный», «равная», «равное»; существительным со словами «который равен», «которая равна», «которое равно»: a **mile's** distance — *расстояние в одну милю; расстояние, равное одной миле; расстояние, которое равно одной миле;* a **bird's**-eye view — вид *с птичьего полета* (общая перспектива).

§ 12. Артикль. Перед существительными в форме единственного числа употребляется неопределенный артикль **a (an).** Определенный артикль **the** стоит перед существительным в том случае, если из предыдущего контекста известно, о каком предмете, обозначенном данным существительным, идет речь: The student has left **the** textbook at home. Определенный артикль произошел от указательного местоимения **that.**

§ 13. Словообразовательные суффиксы — признаки существительных.

-er — runner	**-ance** — importance	**-(s)sion** — session
-or — operator	**-ence** — difference	**-ment** — government
-ing — covering	**-ian** — mathematician	**-ness** — hardness
-ist — biologist	**-dom** — freedom	**-ship** — friendship
-ism — communism	**-hood** — childhood	**-ity** — density
-age — breakage	**-ion** — action	**-(t)ure** — pressure
-al — approval	**-ation** — condensation	**-th** — strength

§ 14. Функции существительных в предложении. Перевод существительных зависит от выполняемой ими в предложении функции. В утвердительном предложении существительное-подлежащее (Subject) стоит перед сказуемым, в вопросительном — между вспомогательным и смысловым глаголами. Предлог никогда не ставится перед существительным-подлежащим, которое переводится на русский язык существительным в именительном падеже: **The middle** of the 19th century saw deep changes in the entire range of building. Doesn't that **Opera House** look charming?

Существительное-дополнение (Object) бывает беспредложным и предложным. Беспредложное дополнение может быть прямым (отвечает на вопросы *кого?, что?*) и косвенным (отвечает на вопрос *кому? чему?*): He watched **the builders** *(кого?)* erecting a high-rise building. My sister showed **her son** *(кому?)* some amusing match-stick drawings.

Предложное дополнение (дополнение с предлогом) употребляется после многих глаголов. Оно отвечает на вопросы *о ком?, о чем?, с кем?, для кого?, кому?, чему?* и т.д.: The civil engineers are speaking *about* **the methods** of speeding up the whole process of building. Great attention is given *to* **prefabrication.**

Существительное-предикатив (Predicative) — именная часть составного именного сказуемого — отвечает на вопросы *каково подле-*

жащее?, кто это?, что оно такое?: The quality of buildings and their low cost are of **great importance.**

Существительное в функции левого определения чаще всего переводят на русский язык или прилагательным: **carbon** dioxide — *углекислый* газ (carbon — углерод, dioxide — двуокись); **arch** dam — *арочная* плотина (arch — арка; dam — плотина) или существительным в родительном падеже: **city** congestion — перенаселенность *города.* Левое определение может быть выражено существительным только в единственном числе: a **car** park (но не: **cars** park).

Существительное с предлогом, стоящее справа от определяемого существительного, выполняет функции правого определения и переводится на русский язык либо прилагательным, либо существительным в родительном падеже: the hall **of residence** — *жилой* корпус; the standards **of admission** — правила *приема.*

Обстоятельство, выраженное существительным, отвечает на вопросы *когда?, где?, почему?* и т.д. Перед существительным-обстоятельством стоит предлог: **After inspection** electricians, plumbers and gas-men begin their work.

§ 15. Перевод левого и правого определений существительного. Определение может стоять слева или справа от определяемого слова.

Для научно-технической литературы на английском языке характерно употребление групп существительного с несколькими левыми определениями («цепочки» существительного).

В качестве левого определения к существительному может использоваться прилагательное, существительное, причастие, числительное, а также сочетания из этих слов, которых часто насчитывается до семи слов: a **high-rise apartment** (левое определение) house **of modern design** (правое определение) — *жилой многоэтажный* дом *современной конструкции;* a **cinema projection** room — *кинопроекционная* будка; the **library book** losses — утеря *библиотечных книг;* the **winter examination** session — *зимняя экзаменационная* сессия.

При переводе трехкомпонентных определительных сочетаний необходимо сначала перевести основное, определяемое существительное, а затем определения к нему: a **hand operated** valve — задвижка, *приводимая в действие ручным способом;* **ground water** table — уровень *грунтовых вод.*

Найти начало группы существительного и определить основное слово группы можно по служебным и значимым словам, которые называются словами-сигналами существительного.

Наиболее часто встречающиеся слова-сигналы, показывающие основное слово группы существительного, следующие:

1) Предлоги (**in, on, of, over** и др.);
2) Глаголы (из них наиболее легко узнаваемые **is, are, was, were, have, has, had, must, can, could, may, might, will, shall, do, does, did** и имеющие окончание **-ed**);
3) Артикли (**a, an, the**);
4) Наречия (**possibly, probably, mainly** и др.);
5) Союзы (**which, that, and** и др.).

Перевод левого определения, состоящего из группы слов, начинают с основного слова и, идя справа налево, устанавливают путем вопросов правильные смысловые отношения между словами группы.

Вопросы к определению могут быть различными, в зависимости от того, какой частью речи выражено определение и какое значение оно имеет: Siberia has made the USSR the **world's leading oil** producer. (Производитель чего? *Нефти.* Какой производитель? *Ведущий*). Неотработанный перевод необходимо отредактировать и расположить слова в порядке, свойственном русскому языку и стилю технической литературы. Например, после ретроспекции и редактирования предложения получаем: Сибирь дала возможность СССР занять *первое место в мире* по производству нефти.

Слева от основного слова часто встречаются слова, соединенные дефисом. Они выражают одно понятие и при переводе рассматриваются как единое целое. Иногда такие группы слов являются терминами и при их переводе необходимо использовать соответствующие русские термины: **Glass-fiber reinforced concrete** products. Изделия *из стекло-волокнистого железобетона.* (Glass-fiber — стекло-волокно; reinforced concrete products — изделия из железобетона).

Первый компонент определительной группы — существительное в общем падеже — переводится на русский язык:

— прилагательным: **gravel** pebbles — *скатанный* гравий (галька);

— существительным в родительном падеже: **pipe** resistance — сопротивление *трубы;*

— существительным с предлогом: a **flanged** branch — рукав с *фланцем.*

Иногда первый компонент может относиться ко второму существительному (а не к основному, определяемому): **pipe laying** tractor — трактор *для укладки труб* (трактор *трубоукладчик*); **pipe-line** ditch — траншея *для укладки труб;* **sludge separating** tank — бассейн *для отделения ила.*

Правое определение может быть выражено существительным с предлогом или группой существительного, а также герундием с предлогом, причастием I или II, прилагательным с пояснительными словами и без пояснительных слов, инфинитивом или несвободным сочетанием существительного с предлогом:

under construction under way	который строится, строящийся, сооружаемый
under development	который разрабатывается, разрабатываемый
under consideration in question in point	о котором идет речь, рассматриваемый
under investigation	который исследуется, исследуемый
in use in operation	который используется, используемый
in existence	который существует, существующий
in service	находящийся в эксплуатации
of interest	представляющий интерес

Если правое определение выражено инфинитивом (в форме страдательного или действительного залога), оно переводится придаточными предложениями, начинающимися союзом «который». Инфинитив в форме страдательного залога **(to be considered)** обычно имеет оттенок необходимости или значение будущего времени. Поэтому при переводе вводятся слова *следует, необходимо* или же глагол употребляется в будущем времени *(которые нужно учесть, которые будут учтены).*

Если у существительного есть определения, стоящие от него справа и слева, то иногда целесообразно перевести сначала определения, стоящие справа, а затем определения, стоящие слева:

1. A **marvellous** report **on the problems of functional analysis** was delivered by our mathematician. *Великолепный* доклад *по проблемам функционального анализа* был прочитан нашим математиком. (1) Доклад по каким проблемам? 2) Какой доклад?)

§ 16. Предлоги (Prepositions). Предлог (в словарях обозначается буквами *prep.*) стоит перед существительным, местоимением или герундием, к которому он относится: Some **of** the students ...; **About** the question...; **On** returning home...; A book **on** history... .

Между предлогом и существительным, к которому он относится, могут находиться определители и левые определения: ... **about** *a difficult* situation.

В английском языке при помощи предлогов выражаются отношения в предложении, соответствующие падежным отношениям в русском языке.

Родительному падежу в английском языке соответствуют сочетания существительных (или местоимений) с предлогом **of:** the agenda **of** the meeting.

Предлог **to** перед существительными в функции дополнения передает отношения, подобные отношениям, выраженным в русском языке дательным падежом: We returned the book **to** the librarian.

Предлог **by** передает отношения, выражаемые в русском языке творительным падежом: The article was published **by** the author in 1975.

Предлог **with** перед существительным, обозначающим орудие действия или предмет, который используется при совершении действия, передает отношения, выражаемые в русском языке творительным падежом: The child couldn't yet eat independently **with** a spoon.

Английские предлоги многозначны:

At 1) *на, в, у* (указывает место): **at** the lecture, **at** school, **at** the wall; 2) указывает на время: **at** 7 o'clock; **at** midnight; 3) указывает на обстоятельства, при которых совершается действие: **at** high speed.

Under указывает на стадию или условия развития процесса: **under** construction — *при* строительстве (*в стадии* строительства).

In 1) указывает местонахождение предмета и место совершения действия: **in** Gorky Street; 2) указывает на промежуток времени в будущем, отвечает на вопрос *когда?:* **in** a month, **in** a year; 3) с существительными образует устойчивые сочетания: **in** the morning; 4)

употребляется при указании названия языка: The sentence was written **in** French.

On 1) указывает на тематику книги, лекции и т.п.: a book **on** mathematics; 2) указывает на время выполнения действия: **On** his arrival ... — *после* своего прибытия... .

From 1) указывает на начало действия: **from** 2 o'clock...; 2) употребляется для выражения длительности действия с предлогами **till** или **to: from** morning **till** night.

Since указывает, с какого момента началось действие: **since** childhood; **since** 1917.

Through 1) указывает на движение через предмет: **through** the pipe *по* трубе; 2) указывает причину: **through** the failure — *из-за* поломки.

Over указывает на расположение над предметом: **over** the window — *над* окном.

Before — *перед, до*

Beyond — *за, вне*

By — *у, к*

Between указывает на расположение предмета относительно двух других предметов: **between** the door and the table — *между* дверью и столом.

For указывает на продолжительность действия: **for** a week — *в течение* недели.

Besides передает значение «кроме» (в смысле «сверх чего-либо», «кроме того»): **Besides** reading books he managed to write short stories.

Till указывает на предел действия: **till** 12 o'clock.

To указывает на предел движения, расстояния, времени: The width is **from** 20 **to** 30 ft. He worked **from** Monday **to** Sunday.

To иногда употребляется с предлогом **up: Up to** 12 — *до* 12.

Until указывает на предел действия во времени: **until** 1979 — *до* 1979 г.

Значение многозначного предлога определяется не только словами, перед которыми он стоит, но и теми словами, за которыми он следует. Во многих случаях употребление того или иного предлога зависит исключительно от предшествующего глагола: This subject consists **of** many items.

Для употребленных в некоторых значениях предлогов нет соответствующих им русских предлогов, поэтому в русском переводе предлоги могут отсутствовать: He is fond **of** music. Он любит музыку.

Иногда предлог может отсутствовать в английском предложении, а при переводе на русский язык употребление предлога обязательно: He entered the Institute two years ago. Он поступил *в* институт два года тому назад. She couldn't answer my question. Она не могла ответить *на* мой вопрос.

§ 17. Совпадение предлогов с другими частями речи. По внешнему виду предлоги совпадают с другими частями речи, а именно с наречием, союзом, причастием I.

Предлоги (Prepositions)	*Наречия (Adverbs)*
about о, об; про; относительно; по	**about** приблизительно, недалеко
above над; выше, свыше, больше	**above** наверху, наверх, выше
across через, сквозь	**across** поперек, на другой стороне
around вокруг	**around** приблизительно, кругом
before до, перед	**before** раньше, прежде
behind позади, сзади	**behind** сзади, назад
beyond вне, за	**beyond** по ту сторону
down вниз, ниже, по	**down** вниз
inside внутрь, в	**inside** внутри, внутрь
like как	**like** подобно
near около	**near** поблизости, рядом с
out (of) из	**out** вне, снаружи
outside за *(пределами)*	**outside** снаружи
over над, через	**over** свыше *(указывает конец действия)*
round вокруг, за	**round** обратно, кругом
since с *(какого-то периода времени)*	**since** с тех пор
through через, сквозь, из-за	**through** от начала до конца
under под	**under** меньше
up по	**up** наверх, наверху

Предлоги	*Союзы (Conjunctions)*
after после, за, вслед за	**after** после того, как
before перед, до	**before** перед тем, как; до того, как
for для, за, в течение	**for** так как
except кроме	**except** исключая
since с *(о времени)*	**since** так как, с тех пор
till до *(о времени)*	**till** до тех пор, пока
until до *(о времени)*	**until** до тех пор, пока не

Предлоги	*Причастие I*
concerning о, относительно, касательно	**concerning** касающийся, касаясь
following за, после, вслед	**following** следующий, следуя
regarding относительно	**regarding** рассматривающий, рассматривая

§ 18. Составные и групповые предлоги. Если простые предлоги (**in, at, on, by, to** и др.) и сложные (**upon, into, without**) являются многозначными, то групповые предлоги — словосочетания, играющие роль предлогов, однозначны.

Групповые предлоги наиболее часто употребляются в технической и общественно-политической литературе.

according to — согласно
as far as — до
as for — что касается
as regards — в отношении; что касается
as to — что касается
because of — из-за
by means of — посредством; при помощи
by way of — с помощью
close to — рядом с
compared to / **compared with** } по сравнению с
contrary to — вопреки
due to — из-за; благодаря *(чему-либо)*
in addition to — в дополнение к
in case of — в случае
in comparison with — по сравнению с
in connection with — в связи с
in front of — впереди; перед
in order to — для того, чтобы
in place of — вместо
in relation to — по отношению к
in spite of — несмотря на
instead of — вместо
in the course of — в течение
in accordance with — в соответствии с
in view of — ввиду
next to — рядом
on account of — из-за, вследствие
opposite to — в противоположность
out of — из, изнутри
owing to — благодаря
thanks to — благодаря
up to — до
with regard to — относительно
with respect to — относительно

Предлоги **at, from, in, by, till, about, for, within** используются при указании времени совершения действия.

Предлоги **by, with** употребляются для обозначения инструментальности, а производные **due to, because of, owing to** — причинности.

Предлоги **with, together with** используются для выражения совместности.

§ 19. Прилагательные (Adjectives). Прилагательное (в словарях обозначается буквой *a*). Его легко распознать по суффиксу, который является формальным признаком прилагательного:

-able	workable — работоспособный
-ible	visible — видимый

-al	chemical — химический
-an/-ian	Hungarian — венгерский
-ant	resistant — сопротивляющийся (способный к сопротивлению)
-ary	primary — первичный
-ory	refractory — огнеупорный
-ed	wooded — лесистый
-ent	different — различный
-ful	careful — заботливый (**-ful** *выражает наличие качества*)
-ic	historic — исторический
-ive	defensive — защитный
-less	jobless — безработный (**-less** *выражает отсутствие качества*)
-ly	yearly — ежегодный
-ous	tremendous — огромный
-y	rainy — дождливый
-er	shorter — короче
-est	shortest — кратчайший
-ish	reddish — красноватый

Степени сравнения прилагательных. В том случае, если надо указать на большую степень качества одного предмета по сравнению с качеством другого предмета, к основе односложного или двусложного прилагательного с ударением на первом слоге прибавляется суффикс **-er** (**shorter** — *короче*), образуя его сравнительную степень (Comparative Degree). Если же надо указать на высшую степень качества данного предмета, прибавляют суффикс **-est** (**the shortest** — *кратчайший*), образуя его превосходную степень (Superlative Degree)

Сравнительная степень большинства прилагательных, состоящих из двух и более слогов, образуется при помощи слова **more** *более*: usable — **more** usable.

Превосходная степень большинства многосложных прилагательных образуется при помощи слова **most:** It was **the most convenient** flat he had ever seen. Так данный предмет по своему качеству выделяется из всех прочих подобных ему предметов. Перед прилагательным в превосходной степени употребляют артикль **the:** The BAM will be **the shortest** way to the ocean.

Формы сравнительной степени прилагательных, которые образуются не по правилам

good — better — the best — *хороший, лучше, наилучший*
bad — worse — the worst — *плохой, хуже, наихудший*
little — less — the least — *маленький, меньше, наименьший*
much — more — the most } — *много, больше, наибольший*
many — more — the most }

При сравнении разной степени качества употребляется союз **than** — *чем*.

При указании на равную степень качества разных предметов употребляют парные союзы **as** ... **as** — *так же, как.*

При указании на отсутствие равной степени качества предметов употребляют парные союзы **not so** ... **as** — *не так ... как.*

Наличие перед прилагательным в превосходной степени неопределенного артикля **a (an)** указывает лишь на высокую (а не на высшую) степень качества: **a most** interesting story — *крайне (очень, весьма)* интересный рассказ.

В предложении прилагательные являются определениями. Сами они, в свою очередь, могут определяться наречиями, указывающими на степень качества. Наречия меры и степени обычно занимают место перед прилагательным, которое они определяют: **too** difficult — *слишком* трудный, **far** better — *значительно* лучше, **still** more interesting — *еще* более интересный. Однако наречие степени **enough** стоит после прилагательного: This beam is long **enough.** Эта балка *достаточно* длинная.

Если перед прилагательным стоит артикль, прилагательное преобразуется в существительное: **the past** and **the future** — *прошлое* и *будущее.*

Префиксы прилагательных

Префикс **anti-** передает значение «против-», «анти-»: **anti**social — *анти*общественный.

Префикс **un-**, прибавленный к основе прилагательных, передает значение противоположности или отрицания: suitable — **un**suitable — *не*подходящий; important — **un**important — *не*важный; breakable — **un**breakable — *не*бьющийся.

Такие производные прилагательные переводятся на русский язык не только производными прилагательными с префиксом *не-*, но и прилагательными с префиксами *без-/бес-:* **un**mistakable — *без*ошибочный, либо описательным способом: **un**controllable — *не поддающийся* контролю, регулированию.

Префиксы **ir-, in-, im-** передают значение отрицания того, что выражено корнем слова: **ir**replaceable — *не*заменимый; direct — **in**direct — *не*прямой (косвенный); possible — **im**possible — *не*возможный. Префиксы **in-, im-,** прибавленные к основе прилагательного, являются еще и признаком производных прилагательных с противоположным значением: **in**dependent — *не*зависимый.

Префикс **non-** также передает значение противоположности, отрицания: **non**conducting — *не*проводящий.

Префиксы **pre-** и **post-** указывают соответственно на значения «до» и «после»: **pre**cautionary — *пред*упредительный; **pre**revolutionary — *до*революционный; **pre**tensioned — с *предварительным* натяжением; **post**tensioned — с *последующим* натяжением.

Префикс **semi-** имеет значение «полу-»: **semi**-official — *полу*официальный; **semi**-colonial — *полу*колониальный.

Sub- указывает на положение ниже чего-либо: **sub**tropical — *суб*тропический.

Super- указывает на превосходство или преобладание в качестве, размере, степени — «сверх-»: **super**fine — лучшего качества.

Inter- — «меж», «между», «взаимно»: **inter**national — *между*народный; **inter**dependent — зависящий *один от другого (взаимо*зависимый).

Extra- — «дополнительно», «особо»: **extra**ordinary — необыкновенный.

Ultra- — «ультра», «сверх»: **ultra**modern — *ультра*модный; **ultra**violet — *ультра*фиолетовый.

Hyper- — «сверх», «пре», «гипер», «ультра»: **hyper**sonic — *сверх*звуковой.

Trans- — «за», «через», «транс-», «по ту сторону»: **trans**atlantic — *транс*атлантический; **trans**continental — *транс*континентальный.

Infra- указывает на расположение ниже чего-либо; в русском языке иногда соответствует компоненту «инфра-»: **infra**-red — *инфра*красный; **infra**structure — основание, фундамент, нижнее строение.

§ 20. Числительные (Numerals). В английском языке, так же, как и в русском, имеются количественные и порядковые числительные.

Количественные числительные выполняют в предложении следующие функции:

Подлежащего: Three multiplied by three makes nine.

Дополнения: Subtract **10** from **25** and you will get (have) **15**.

Именной части сказуемого: There were **150**.

Определения: He has got a **thousand** books on art and literature.

Обстоятельства: She comes home at **7**.

Числительные

Количественные	*Порядковые*
1 one	1st the first
2 two	2nd the second
3 three	3rd the third
4 four	4th the fourth
5 five	5th the fifth
6 six	6th the sixth
7 seven	7th the seventh
8 eight	8th the eighth
9 nine	9th the ninth
10 ten	10th the tenth, etc.
100 a (one) hundred	100th (one) hundredth
101 one hundred and one	101st the (one) hundred and first
1,000 a (one) thousand	1,000th the (one) thousandth
1,000,000 a (one) million	1,000,000th the (one) millionth

Числительные в датах. В английском языке слово **year** *год* после даты не употребляется: She was born in 1960 (nineteen sixty).

Запятая в английской системе знаков (а не точка, как в русском

языке) указывает на числовые разряды: 7,765,381 — seven million, seven hundred and sixty-five thousand, three hundred and eighty-one.

Точка (point) между цифрами в английской системе арифметических знаков является знаком десятичности, т. е. целое число отделяется от десятичной дроби точкой, а не запятой, как в русском языке. Точка может ставиться в середине строки: 12·5 — twelve point five. При чтении чисел с десятичными дробями сначала называют целое число, затем говорят "point" а затем — цифры дроби: **19.985** — nineteen **point** nine eight five.

Простые дроби читаются так же, как и в русском языке: 3/4 — three fourths.

В том случае, если числитель больше единицы, то к порядковому числительному знаменателя прибавляют суффикс множественного числа **-s** [s]: 1/4 — one fourth; 3/4 — three fourths.

В названиях смешанных чисел между целым числом и дробью стоит союз **and**: 5 1/2 — five **and** a half.

§ 21. Глагол (Verb). В словарях глаголы обозначаются буквой *v*.

1. Личные и неличные формы глагола. Личные формы глагола употребляются в предложении в функции сказуемого, в повествовательном предложении они всегда стоят на втором месте после подлежащего. Лицо и число личной формы глагола можно всегда определить по подлежащему, с которым личная форма соотносится: I **study** building materials. Я *изучаю* строительные материалы. They **study** building materials. Они *изучают* строительные материалы.

Форма глаголов в настоящем неопределенном времени в 3-м лице единственного числа имеет суффикс **-s**:

v-s

Нулевой суффикс личной формы глагола в форме настоящего времени указывает на одно из лиц множественного числа:

v^0	We **study**	Мы *изучаем*.
	You **study**	Вы *изучаете*.
	They **study**	Они *изучают*.

Форма настоящего неопределенного времени для всех лиц (кроме 3-го лица единственного числа) совпадает с неличной формой глагола — инфинитивом без частицы **to**. Необходимо обратить внимание на то, что формы глагола в настоящем неопределенном времени в 3-м лице единственного числа, имеющие суффикс **-(e)s** иногда совпадают с формой множественного числа существительного:

Глагол (Verb)	*Существительное (Noun)*
works — *работает*	**works** — *завод, мастерские*
functions — *функционирует, работает*	**functions** — *действия, функции*

Форма стандартного глагола в прошедшем времени, имеющая окончание **-(e)d**, совпадает с окончанием причастия II:

Глагол в прошедшем неопределенном времени	*Причастие II*
built — *строил (-а, -о)*	**built** — *построенный*
The students **built** a new club for collective farmers last year.	The new club **built** by the students for collective farmers was made of brick.

2. Неличные формы глагола: инфинитив, причастия I и II и герундий.

Внешние признаки инфинитива — частица **to: to build**.

Внешние признаки причастия I и герундия — окончание **-ing**.

Причастие II оканчивается на **-ed: worked** или имеет особую форму: **brought, built.**

Смысловые и вспомогательные глаголы. Смысловые глаголы имеют самостоятельное значение и выполняют в предложении функцию простого глагольного сказуемого: The civil engineer **constructs** and **reconstructs** residential and industrial buildings.

Глаголы **to have** *иметь*, **to be** *находиться* и **to do** *делать* могут употребляться как вспомогательные и как смысловые.

Признаком самостоятельности глаголов **to have, to be, to do** является наличие в предложении дополнения, выраженного существительным или его сочетанием, местоимением или числительным, которые стоят после этих глаголов: The flat **has** 3 rooms. He **does** his physical training every day.

§ 22. Спряжение глагола TO BE.

Настоящее время (Present Tense)

Единственное число	*Множественное число*
I **am** in the laboratory. Я *нахожусь* в лаборатории.	We (you, they) **are** in the laboratory. Мы *находимся* (вы *находитесь*, они *находятся*) в лаборатории.
He **is** in the laboratory. Он *находится* в лаборатории.	

Прошедшее время (Past Tense)

Единственное число	*Множественное число*
I **was** in the laboratory. Я *был* в лаборатории.	We **were** in the laboratory. Мы *были* в лаборатории.
	You **were** in the laboratory. Вы *были (ты был)* в лаборатории.
He **was** in the laboratory. Он *был* в лаборатории.	They **were** in the laboratory. Они *были* в лаборатории.

Будущее время (Future Tense)

Единственное число	*Множественное число*
I **shall be** in the laboratory. Я *буду (находиться)* в лаборатории.	We **shall be** in the laboratory. Мы *будем (находиться)* в лаборатории.
He (she) **will be** in the laboratory. Он (она) *будет* в лаборатории.	They **will be** in the laboratory. Они *будут (находиться)* в лаборатории.

§ 23. Спряжение глагола TO HAVE.

Настоящее время (Present Tense)

I **have** a journal.	У меня *есть (имеется)* журнал.
He, She } has a journal.	У него, У нее } *есть* журнал.
We, You, They } have journals.	У нас, У вас, У них } есть журналы.

Прошедшее время (Past Tense)

I **had** a day off yesterday.	У меня (вчера) *был* выходной.
He, She } **had** a day off yesterday.	У него, У нее } *был* выходной.
We, You, They } **had** a day off yesterday.	У нас, У вас, У них } *был* выходной.

Будущее время (Future Tense)

I **shall have** a day off.	У меня *будет* выходной.
He, She } **will have** a day off.	У него, У нее } *будет* выходной.
We **shall have** a day off.	У нас, У вас, У них } *будет* выходной.
You, They } **will have** a day off.	

§ 24. Переходные глаголы и непереходные глаголы. Непереходные глаголы выражают состояние, движение, положение в пространстве: She goes to the Institute every day.

В английском языке имеется ряд переходных глаголов, которые в русском языке соответствуют непереходным глаголам, требующим после себя употребления предлогов, например: **to answer** the question — *отвечать* **на** вопрос; **to influence** the temperature —

влиять на температуру; **to follow** the discussion — *следить* за обсуждением.

Есть в английском языке непереходные глаголы, требующие предложного дополнения, которые в русском языке соответствуют переходным глаголам, например: **to wait for** the results — *ждать* результатов; **to listen to** the reading — *слушать* чтение.

§ 25. Стандартные и нестандартные глаголы. Глаголы, образующие Past Tense и Participle II путем прибавления к инфинитиву (без частицы **to**) суффикса **-ed(-d)**, называются стандартными (Regular Verbs).

Глаголы, у которых вторая и третья формы образуются без прибавления суффикса **-ed**, а различными другими способами, называются нестандартными **(saw, brought, made)**.

Нестандартные глаголы (Irregular Verbs)

Все три формы разные

be	was, were	been	see	saw	seen
do	did	done	grow	grew	grown
go	went	gone	know	knew	known
break	broke	broken	blow	blew	blown
speak	spoke	spoken	throw	threw	thrown
forget	forgot	forgotten	fly	flew	flown
			eat	ate	eaten
			give	gave	given
i	**a**	**u**	forgive	forgave	forgiven
drink	drank	drunk	write	wrote	written
sing	sang	sung	bear	bore	born
sink	sank	sunk	tear	tore	torn
begin	began	begun	wear	wore	worn
ring	rang	rung	take	took	taken
			fall	fell	fallen
			freeze	froze	frozen
			bite	bit	bitten
			hide	hid	hidden

Все три формы одинаковые

cut	cut	cut	hit	hit	hit
put	put	put	let	let	let
set	set	set	cast	cast	cast
cost	cost	cost	hurt	hurt	hurt
shut	shut	shut	spread	spread	spread
upset	upset	upset	bet	bet	bet
read [ri:d]	read [red]	read [red]			

Вторая и третья формы одинаковые			Вторая и третья формы имеют одинаковые гласные		
send	sent	sent	mean	meant	meant
build	built	built	lose	lost	lost
spend	spent	spent			
bend	bent	bent	**Гласные меняются**		
lend	lent	lent			
creep	crept	crept	meet	met	met
dig	dug	dug	sit	sat	sat
make	made	made	get	got	got
have	had	had	think	thought	thought
tell	told	told	bring	brought	brought
say	said	said	fight	fought	fought
hear	heard	heard	teach	taught	taught
keep	kept	kept	buy	bought	bought
pay	paid	paid	catch	caught	caught
lay	laid	laid	seek	sought	sought
feel	felt	felt			
hold	held	held	**Первая и третья формы одинаковые**		
leave	left	left			
feed	fed	fed	run	ran	run
lead	led	led	come	came	come
find	found	found	become	became	become
wind	wound	wound			
bind	bound	bound			
win	won	won			
strike	struck	struck			
hang	hung	hung			
burn	burnt, (burned)	burnt, (burned)			
learn	learnt	learnt			
spoil	spoilt	spoilt			

§ 26. Времена группы Indefinite.

Форма	Время (Tense)		
	Простое настоящее Present Indefinite	Простое прошедшее Past Indefinite	Простое будущее Future Indefinite
Утвердительная	Soviet builders constantly **improve** their building methods. Our state **spends** great sums of money on housing construction.	Last month many families **received** three-room flats. Our state **spent** a lot of money on education last year.	Our builders **will complete** the new hostel next year. Our Institute **will spend** much money on new laboratory equipment.
Вопросительная	**Do** Soviet builders constantly **improve** their bulding methods?	**Did** many families **receive** three-room flats last month?	**Will** our builders **complete** the new hostel next year?
Отрицательная	The device **does not work.**	The device **did not work** yesterday.	We **shall not go** to the institute on Sunday.

Все глаголы в английском языке, кроме **to be, to have, can, may, must** образуют вопросительную и отрицательную формы Present и Past Indefinite с помощью изменяемых форм вспомогательного глагола **to do**.

В технической литературе вспомогательный глагол **will**, служащий для образования будущего времени, часто переводится на русский язык настоящим временем. Это объясняется тем, что **will** выражает обычное действие: Tower cranes **will incorporate** the usual safety devices. В башенных кранах *есть* предохранительные приспособления.

§ 27. Времена группы Continuous. Видовые формы в английском языке характеризуют глагол не с точки зрения законченности действия, а с точки зрения соотнесенности действия с определенными моментами или отрезком времени, в котором оно развивается.

Глагол в форме Continuous показывает, что действие происходит в момент речи (Present Continuous), происходило в какой-то отрезок времени в прошлом (Past Continuous) или будет происходить (Future Continuous).

Глагол в форме Continuous переводится на русский язык глаголом несовершенного вида, напр., *читал* (**а не** прочитал).

Форма	Время (Tense)		
	Present Continuous	Past Continuous	Future Continuous
Утвердительная	She **is reading** a book now.	He **was reading** a book when she came.	I **shall be reading** a book from 10 till 11 a. m. tomorrow.
Вопросительная	**Is** she **reading** a book now?	**Was** he **reading** a book when she came?	**Shall** I **be reading** a book from 10 till 11 a. m. tomorrow?
Отрицательная	She **is not reading** a book now.	He **was not reading** a book when she came.	I **shall not be reading** a book from 10 till 11 a. m. tomorrow.

Признаком формы продолженного вида является сочетание вспомогательного глагола **to be** и основы смыслового глагола с суффиксом **-ing** (причастие I): I **am reading** a book. Я *читаю* книгу. She **was writing** a letter. Она *писала* письмо. We **shall come** tomorrow. Мы *придем* завтра.

§ 28. Модальные глаголы (Modal Verbs) и их эквиваленты.

Модальный глагол CAN и его эквивалент TO BE ABLE TO

Present	Past	Future	Примечание
I can translate this article without a dictionary. *Я могу перевести* эту статью без словаря. **I am able to fulfil** this task today. *Я могу (в состоянии) выполнить...*	**I could translate** this article without a dictionary (last year). *Я мог перевести* эту статью без словаря (в прошлом году). **I was able to fulfil** this task yesterday. *Я мог (был в состоянии) выполнить...*	**I shall be able to translate** this article without a dictionary next year. *Я смогу перевести* эту статью без словаря в следующем году. **We shall be able to fulfil** this task tomorrow. *Мы сможем выполнить...*	Вместо глагола **can** в будущем времени употребляется **shall be able** или **will be able** + инфинитив с частицей **to**.

Модальный глагол MUST и его эквиваленты TO HAVE TO и TO BE TO

Present	Past	Future	Примечание
He **must go** to see his doctor now. Он *должен идти...*	—	—	1) **shall have** или **will have** + инфинитив с частицей **to** употребляется для выражения долженствования в будущем времени. 2) Глагол **had, was (were)** + инфинитив с частицей **to** в прошедшем времени заменяют **must**.
He **has to go** to see his doctor now. Он *должен (ему приходится) идти* сейчас к врачу.	He **had to go** to see his doctor yesterday. Он *должен был идти...*	He **wil have to go** to see his doctor as soon as possible. Он *должен будет идти...*	
I **am to translate** this article as soon as possible. *Я должен (по договоренности с кем-то) переводить...*	I **was to translate** this article as soon as possible. *Я должен был (по договоренности с кем-либо) переводить...*	—	

Модальный глагол MAY и его эквивалент TO BE ALLOWED TO

Present	Past	Future	Примечание
I am told that I **may translate** this article. Мне сообщают, что я *могу переводить*...	I was told that I **might translate** this article. Мне сообщили, что я *могу переводить*...	I shall be told that I'**ll be allowed to translate** this article. Мне сообщат, что мне *разрешат переводить*...	**Shall be allowed, will be allowed** + инфинитив с частицей **to** в будущем времени заменяют глагол **may**.
I **am allowed to translate** this article. Мне *позволяют переводить* эту статью.	I **was (We were) allowed to translate** this article. Мне (нам) *позволили перевести* эту статью.	I **shall be allowed to translate** this article. Мне *позволят перевести* эту статью.	В прошедшем времени для выражения разрешения употребляется глагол **to allow** в страдательном залоге.

§ 29. Выражение долженствования. В русском языке долженствование выражается различными словами: *должен (должно)*, *надо*, *нужно*, *необходимо*, *следует*, *приходится* и т. д.

В английском языке долженствование может быть выражено глаголами, за которыми следует

1) инфинитив без частицы **to**:

must — *должен*, *надо*, *нужно* (в настоящем времени во всех лицах);

shall — *должен*, *должны* (во 2-м и 3-м лицах единственного и множественного числа);

should — *должен*, *(-жны); следует*, *следовало бы* (во всех лицах);

2) инфинитив с частицей **to**:

to have (to) — *должен*, *приходится* (в настоящем, прошедшем и будущем времени);

to be (to) — *предстоит* (в настоящем и прошедшем времени);

to be obliged (to) — *быть обязанным* (во всех временах);

ought to — *должен*, *следовало бы* (во 2-м и 3-м лицах).

§ 30. Пассивная форма времен группы Indefinite. Форма глагола в пассиве указывает на то, что действие, выраженное глаголом-сказуемым, направлено на подлежащее. *The bridge* **was built**. — **Мост** *построили (построен)*.

Показателем лица, числа и времени служит вспомогательный глагол **to be** (т. е. **am, is, are, was, were, shall be, will be, have been, has been, had been, is being, was being, should be, should have been**) в сочетании с причастием II **(Participle II)**.

Смысловой глагол стоит в форме Participle II, т. е. остается всегда неизменным, как всякая неличная форма.

The article **is being translated**. Статью *переводят*.

The article **was translated**. Статью *переводили*.

The articles **were being translated**. Статьи *переводили*.

The articles **will be translated**. Статьи *переведут*.

Если указано, кем или чем производится действие, то употребляется существительное или местоимение, управляемое предлогами **by** или **with**. Эти предлоги выражают отношения творительного падежа. Вопросительная форма глаголов в **Passive** образуется так же, как и формы других сложных времен: на место перед подлежащим выносится глагол в личной форме (первый вспомогательный глагол). При образовании отрицательной формы отрицание **not** ставится после глагола в личной форме:

Will this article **be translated** on Sunday? This article **will not be translated** on Sunday. **It will be translated** on Saturday.

§ 31. **Форма простого будущего времени в прошедшем** (Future-in-the-Past Indefinite Tense). Форма глагола, состоящая из вспомогательного глагола should [ʃud] или would [wud] и основы инфинитива (без частицы **to**) употребляется для образования будущего простого времени в прошедшем. Глаголы в этом времени выражают действие, которое рассматривается как будущее относительно прошлого. She wrote that **she would arrive** the following Friday. Она написала, что приедет в следующую пятницу.

§ 32. **Группа перфектных временных форм** (Perfect Tenses). Группа перфектных времен состоит из четырех времен: настоящего, прошедшего, будущего и будущего в прошедшем. Глаголы во всех формах этой группы состоят из вспомогательного глагола **to have** в надлежащем времени и смыслового глагола в третьей форме (Причастие II).

to construct (стандартный глагол)

Настоящее перфектное время: I **have constructed.**
Прошедшее перфектное время: He **had constructed.**
Будущее перфектное время: We **shall have constructed.**
Будущее в прошедшем перфектное время: They **would have constructed.**

to build (нестандартый глагол)

Настоящее перфектное время: I **have built.**
Прошедшее перфектное время: He **had built.**
Будущее перфектное время: We **shall have built.**
Будущее в прошедшем перфектное время: I **should have built.**

Глаголы во всех временных формах этой группы выражают действие, предшествующее какому-нибудь другому действию.

В вопросительной форме подлежащему обычно предшествует вспомогательный глагол: **Had** *he* **built**?

В отрицательной форме за первым вспомогательным глаголом следует отрицательное слово: I **should** *not* **have built.**

§ 33. Глагольные формы группы Perfect в действительном залоге.

Infinitive	Present Perfect	Past Perfect	Future Perfect
to have designed	I **have designed** a new school.	I **had repaired** the roof of my cottage before the rainy season began.	I **shall have repaired** the roof of my cottage before the rainy season begins.
to have built	He **has built** a garage for his new car.	He **had built** a garage for his new car by the 1st of May.	He **will have built** a garage for his new car by the beginning of his vacation.

Формы Perfect переводятся на русский язык глаголами в форме прошедшего или будущего времени совершенного вида.

§ 34. Настоящее совершенное длительное время (Present Perfect Continuous) употребляется для выражения длительного действия, начавшегося в прошлом и продолжающегося в настоящее время.

Глагол в Present Perfect Continuous переводится на русский язык глаголом в настоящем времени: She **has been working** here for five years. Она *работает* здесь пять лет.

§ 35. Формы Perfect Passive.

Infinitive	Present	Past	Future
to have been asked	I **have** just **been asked** some questions. Мне только что *задали* несколько вопросов.	She **had been asked** some questions before the director came. Ей *задали* несколько вопросов до того, как пришел директор.	She **will have been asked** some questions before the director comes. Ей *будет задано*...

§ 36. Формы Continuous Passive.

Способ образования	Название глагольных форм	Английское предложение	Перевод на русский язык
to be being + причастие II смыслового глагола **am being asked** / **is** / **are** } **being built**	Present Continuous Passive	New hydroelectric stations **are being built** in Siberia.	*строятся* *строят*
to be being + причастие II смыслового глагола **was** / **were** } **being built**	Past Continuous Passive	New hydroelectric stations **were being built** at that time.	*строились* *строили*

Временну́ю форму глагола-сказуемого в страдательном залоге следует определять по временно́й форме вспомогательного глагола:

I *am* **examined.**	Простое настоящее время.
It *is being* **built.**	Настоящее продолженное время.
They *had been* built.	Прошедшее перфектное время.
Several new hydroelectric stations *will have been* **completed** by the end of the current year.	Будущее перфектное время.

§ 37. Соотнесенность временны́х форм глаголов-сказуемых главных и придаточных предложений и их перевод на русский язык. 1) Если глагол-сказуемое главного предложения стоит в прошедшем времени, а глагол-сказуемое придаточного дополнительного стоит в форме простого прошедшего или прошедшего продолженного времени, сказуемое придаточного предложения выражает действие, одновременное с действием сказуемого главного предложения.

На русский язык сказуемое придаточного предложения в таких случаях переводят глаголом в настоящем времени: He **wrote** that he **worked** in Kiev. Он *написал* о том, что *работает* в Киеве. Сказуемое придаточного дополнительного предложения **worked,** стоящее в форме простого прошедшего времени, выражает действие, одновременное с **wrote**. Поэтому оно переводится на русский язык глаголом настоящего времени — «работает».

Сравните это предложение с предложением: He **wrote** that he **had worked** in Kiev. Он *написал*, что он **работал** в Киеве.

2) Если глагол-сказуемое главного предложения стоит в прошедшем времени, а глагол-сказуемое придаточного дополнительного предложения стоит в форме прошедшего перфектного времени, сказуемое придаточного предложения выражает действие, предшествующее действию, выраженному сказуемым главного предложения. На русский язык сказуемое придаточного предложения переводится глаголом в прошедшем времени: She **knew** that the students **had** already **passed** their examinations. Она **знала,** что студенты уже *сдали* экзамены.

3) Если глагол-сказуемое главного предложения стоит в будущем времени или в повелительном наклонении, а глагол-сказуемое придаточного предложения времени или условия стоит в одной из форм настоящего времени, он выражает будущее действие и на русский язык переводится глаголом в будущем времени: If she **returns** soon, **let** her **wait** for me here. Если она скоро *вернется*, *пусть* меня здесь *подождет*. I **hoped** that I **should find** her at home. Я *надеялся*, что *застану* ее дома.

§ 38. Сослагательное наклонение (Subjunctive Mood). Личная форма глагола в сослагательном наклонении показывает, что выражаемые действия являются желательными или предполагаемыми.

Формы Subjunctive переводятся на русский язык формами русского сослагательного наклонения — сочетанием глагола в форме прошедшего времени с частицей **бы:** Я *построил бы* это, я *хотел бы построить* и т.п., или без частицы **бы,** если эта частица уже имеется в составе союза *чтобы, если бы.* Например: Необходимо, *чтобы* **вы построили** этот дом.

It is necessary that this crane **should be used** on our construction site.	Необходимо, *чтобы* этот кран *использовался* на нашей стройке.
It **would have been impossible** to use such equipment several years ago.	Несколько лет тому назад *было бы невозможно использовать* такое оборудование.

Форма настоящего времени сослагательного наклонения (Present Subjunctive) и сочетание **should** + Infinitive без частицы **to** употребляется в придаточных предложениях, начинающихся с союза **that** и стоящих после оборотов, выражающих необходимость, долженствование, желательность, вероятность, возможность: **It is important** — *важно;* **It is required** — *требуется;* **It is possible** — *возможно.*

§ 39. Условные предложения (Conditional Sentences).

Тип предложения	Придаточное условное	Главное предложение
	Реальное, вероятное условие	
Изъявительное наклонение:	*Present Indefinite:*	*Future Indefinite*
I тип (переводится глаголом в **будущем времени**)	If he **studies** well,.. Если он *будет* хорошо *учиться,...*	he **will become** a highly qualified specialist. он *будет* высококвалифицированным *специалистом.*
	Нереальное, невероятное (маловероятное) условие	
Сослагательное наклонение: II тип — переводится глаголом в **прошедшем времени** с частицей «бы»	*Past Indefinite:* If he **studied** well,... Если *бы* он учился хорошо,...	**should (would, could, might)** + **Infinitive** без to he **would become** a highly qualified **specialist.** он *стал бы* высококвалифицированным *специалистом.*
Сослагательное наклонение: III тип (переводится глаголом в **прошедшем времени** с частицей «бы»)	*Past Perfect:* If he **had studied** well at the Institute,... Если *бы* он *учился* в институте хорошо,...	**should (would, could, might)** + **Perfect Infinitive** без **to** he **would have become** a highly qualified **specialist.** он *бы стал* квалифицированным *специалистом.*

В условных предложениях II и III типов в главном предложении могут употребляться глаголы **might, could:** If she **had had** more **time** yesterday, she **might have done** this work.

Во всех трех типах английских придаточных условных предложений **if, provided** *(если, при условии)* могут быть опущены.

§ 40. Неличные формы глагола (Non-Finite Forms of the Verb). Неличные формы глагола в отличие от личных форм выражают действие без указания лица и числа. Поэтому неличные формы глагола не могут выполнять в предложении функции сказуемого. Свои глагольные свойства они сочетают со свойствами других частей речи, выполняя в предложении синтаксические функции этих частей речи.

НЕЛИЧНЫЕ ФОРМЫ ГЛАГОЛА

Причастие (Participle)

Participle	*Active*	*Passive*
Participle I	designing	being designed
Participle II	—	designed
Perfect Participle	having designed	having been designed

Инфинитив (Infinitive)

Infinitive	*Active*	*Passive*
Indefinite	(to) design	(to) be designed
Continuous	(to) be designing	—
Perfect	(to) have designed	(to) have been designed
Perfect Continuous	(to) have been designing	—

Герундий (Gerund)

Gerund	*Active*	*Passive*
Indefinite	designing	being designed
Perfect	having designed	having been designed

§ 41. Причастие I (Participle I). Причастие I представляет собой неличную форму глагола с суффиксом **-ing.** В русском языке причастию I соответствует обычно причастие, оканчивающееся на *-щий, -щая, -щие, -щиеся,* реже на *-вший, -вшие* или деепричастие: **building** — *строящий, строя;* **giving** — *дающий, давая, давший, дав(ши).*

Причастие I в функции определения отвечает на вопрос: *какой?, какая?, какое?, какие?* и характеризует предмет, производящий действие. Причастие I может находиться в предложении перед опреде-

ляемым словом. Признаком данной функции причастия I является его положение между артиклем (или другим определителем существительного) и существительным: a **turning** point — *поворотный* пункт; a **moving** object — *движущийся* предмет.

Чтобы определить значение причастия I, нужно найти в словаре глагол, от которого оно образовано. Для этого у причастия I отбрасывают окончание **-ing** (*build***ing** — **build**). Если перед окончанием **-ing** стоит одна согласная, то глагол может оканчиваться на **-e** (*mak***ing** — **make**). Если перед окончанием **-ing** стоят две одинаковые согласные, то глагол будет оканчиваться на одну согласную (*dropp***ing** — **drop**).

Причастие I может находиться в предложении после определяемого слова. В таких случаях причастие I входит в состав определительного причастного оборота, который равнозначен определительному придаточному предложению. Сказуемое такого придаточного предложения выражено личной формой глагола. Таким образом, признаком данной функции причастия I является его положение после существительного:

The man **training** our team is our physical training instructor.	Человек, *тренирующий* нашу команду, является нашим инструктором по физвоспитанию.

В английском языке ни определительное придаточное предложение, ни определительный причастный оборот от определяемого существительного запятой обычно не отделяются.

Причастие I можно отличить от совпадающих с ним по звучанию имен существительных (**building** — *строящий*, **a building** — *здание*) по следующим глагольным признакам:

1. За причастием I может следовать относящееся к нему прямое дополнение: **Placing** *the* mild *steel* close to the concrete face, cracks will be more evenly distributed.
2. Причастие I может определятся наречием: Then we noticed a group of our students **going** *slowly* to the Institute.

Причастие I не может иметь ни артиклей, ни других определителей или определений.

Наличие у слова с суффиксом **-ing** артикля или другого определителя, а также определения (в том числе правого с предлогом **of**), суффиксов **s, -'s(-s')** указывает на то, что слово с суффиксом **-ing** является существительным: *The* **killing** *of bacteria* is usually accomplished by means of chemicals.

Наличие перед причастием I вспомогательных глаголов указывает на то, что причастие I входит в состав формы продолженного вида.

Отсутствие в составе формы причастия I вспомогательного глагола **to have** указывает на неперфектную форму: **using, being used.**

Признаком перфектной формы является наличие в составе причастия I вспомогательного глагола **to have** в форме **having: having used, having been used.**

Причастие I не выражает времени. Форма причастия I указывает только на то, как соотносится действие, выраженное причастием, с действием, выраженным сказуемым.

Формы причастия I	Действительный залог	Страдательный залог
Неперфектная форма выражает действие, происходящее одновременно с действием, выраженным сказуемым.	**using** 1) В функции определения: *применяющий (применявший)* 2) В функции обстоятельства: *применяя (применив)*	**being used** 1) В функции определения: *применяющийся, применяемый, который применяется* 2) В функции обстоятельства: *когда применяется*
Перфектная форма выражает действие, предшествовавшее действию, выраженному сказуемым	**having used** В функции обстоятельства: *применив (уже, до чего-то)*	**having been used** В функции обстоятельства: *после того как применили, когда применили (уже, до чего-то)*

Перфектному причастию I в действительном залоге соответствует в русском языке деепричастие, оканчивающееся на **-в (вши)** или **-я (-а): Having been translated** by the students, the journals were returned to the library. (Сравните: **Translating** the journals... *Переводя...*).

Действие, выраженное причастием, происходило раньше действия, выраженного сказуемым.

Отсутствие в составе формы причастия I вспомогательного глагола **to be** указывает на действительный залог: **using, having used.**

Наличие в составе причастия I вспомогательного глагола **to be** в форме **being, been** в сочетании с третьей формой смыслового глагола указывает на страдательный залог: **being used, having been built.**

Причастие I в форме страдательного залога выражает действие, которое испытывает на себе лицо или предмет, обозначенный словом, к которому причастие относится: **Being** very **interested** in the project, he offered his services immediately. *Будучи* очень *заинтересованным* в проекте, он немедленно предложил свои услуги.

При переводе на русский язык, обстоятельственные обороты со сложными формами причастий в страдательном залоге переводятся обычно придаточными обстоятельственными предложениями с союзами: *так как; после того как; когда* и т.д. При этом причастия переводятся сказуемыми придаточного предложения (подлежащее заимствуется из главной части предложения): **Having been invited** to the conference, the graduates began to work very hard at their reports. *После того как выпускники получили приглашение* на конференцию, они стали упорно работать над докладами.

§ 42. Причастные обороты (Participle Constructions). Причастные обороты в английском языке, выражая обстоятельство, соответствуют деепричастным оборотам в русском языке.

ЗАВИСИМЫЙ ПРИЧАСТНЫЙ ОБОРОТ

Простая форма

Testing a new type of hoisting crane, the engineer offered some recommendations as to its use.	*Испытывая* новый тип подъемного крана, инженер внес несколько рекомендаций в отношении его эксплуатации.

Перфектная форма

Having tested a new type of hoisting crane, the engineer offered some recommendations as to its use.	*Закончив* испытания нового типа подъемного крана, инженер внес несколько рекомендаций в отношении его эксплуатации.

Простая форма с союзом

While testing a new type of hoisting crane, the engineer... .	*При испытании* нового типа *(испытывая новый тип)*..., инженер... .

НЕЗАВИСИМЫЙ ПРИЧАСТНЫЙ ОБОРОТ

Простая форма причастия

Признаками независимого причастного оборота, стоящего в начале предложения, являются:

положение причастия I непосредственно после существительного в общем падеже без предлога, имеющего признаки подлежащего; или положение причастия I непосредственно после местоимения в именительном падеже;

запятая, которая отделяет самостоятельный причастный оборот от главного предложения. Самостоятельный причастный оборот переводится придаточным предложением: The engineer **testing a new type of hoisting crane,** the builders helped him. *Когда инженер испытывал новый тип подъемного крана ...* .

Перфектная форма причастия

1. **The engineer having tested a new type of hoisting crane,** the contractor made use of it. *После того как инженер испытал новый тип подъемного крана,* подрядчик пустил его в ход.

2. **A new type of hoisting crane having been tested,** the builders put it into operation. *После того как новый тип подъемного крана был испытан,* строители пустили его в ход.

Если самостоятельный (независимый) причастный оборот находится во второй части предложения, то при переводе на русский язык вводится сочинительный союз *и* или союзы *а, причем.* При переводе на русский язык перфектной формы причастия чаще всего вводится союз *после того как.*

Перед существительным, стоящим в начале причастного оборота, может находиться предлог **with,** который вводит этот оборот: **With a minimum of changes having taken place in the post-tensioning system,** one can be sure of obtaining a post-tensioned crack-free panel. *Теперь, когда в системе последующего натяжения произошел минимум изменений,* можно получить панель с последующим натяжением с гарантией того, что в ней трещин не будет.

По структуре, значению и способам перевода этот тип причастного оборота не отличается от самостоятельного причастного оборота.

§ 43. Причастие II. Причастие II представляет собой неличную форму глагола. Причастие II стандартных глаголов оканчивается на **-ed: entered, designed, constructed.**

Причастие II нестандартных глаголов имеет различную форму: **built, seen, said.**

Причастие II переходных глаголов имеет форму страдательного залога: в русском языке ему соответствует причастие, оканчивающееся на *-имый, -(е)нный, -тый:* The concrete **used** in building construction is up-to-date. Бетон, *применяемый* в строительной промышленности ... .

Перед причастием II в функции обстоятельства могут стоять союзы **when, if, unless: When reinforced,** concrete regains great strength. *При армировании* бетон набирает большую прочность. **Unless treated,** the water cannot be used for drinking and domestic purposes. *Если не очищать воду,* она не может быть использована для питья и бытовых нужд.

Причастие II в функции обстоятельства переводится 1) сочетанием «*при* + существительное»; 2) придаточным обстоятельственным предложением или 3) деепричастием в страдательном залоге.

Если перед глаголом с суффиксом **-ed** стоит глагол **to be (am, is, are, was, were, shall be, will be, have been, has been),** то суффикс **-ed** является показателем пассивной формы.

Если перед глаголом с суффиксом **-ed** стоит глагол **to have (had, has, shall have, will have),** то это — показатель перфектной формы глагола.

§ 44. Инфинитив и его функции в предложении. Инфинитив в функции подлежащего обычно переводится на русский язык неопределенной формой глагола или существительным в именительном падеже: **To complete** the post-tensioning operation was important. Было важно *завершить* процесс последующего натяжения.

Инфинитив в функции обстоятельства цели переводится придаточным предложением цели или существительным с предшествующим ему предлогом *для*: **To give** the calculated ultimate moments the designer must determine effective prestressing force. *Для того, чтобы обеспечить* вычисленные предельные точки, проектировщик должен определить полезную силу предварительного натяжения.

Признаком инфинитива в функции прямого дополнения является его сочетаемость с определенными глаголами: **want, try, wish, decide, like:** The architect *wanted* **to plan** the work at every stage. Архитектор *хотел запланировать* работу каждой фазы (каждого этапа). He *decided* **to speed up** the work on the construction site. Он *решил ускорить* работу на строительной площадке.

§ 45. Объектный инфинитивный оборот (сложное дополнение). Инфинитив в функции сложного дополнения образует объектный инфинитивный оборот, который состоит из вводящего глагола, существительного (или местоимения) и инфинитива.

Объектный инфинитивный оборот употребляется после вводящих глаголов: **to want, to wish, to like, to know, to think; to suppose** — *предполагать;* **to find** — *находить;* **to believe, to assume** — *полагать;* **to consider** — *считать;* **to suppose, to expect** — *ожидать;* **to allow** — *позволять;* **to show** — *показывать;* **to report** — *сообщать;* **to declare** — *заявлять;* **to understand** — *понимать;* **to watch** — *наблюдать;* **to see, to hear, to feel**

... **(know) + существительное** (или **местоимение) + инфинитив**

I know + my friend (him) + to be a good sportsman. Я *знаю, что мой друг (он) хороший спортсмен.*

После глаголов **to watch, to observe, to make** *(заставлять)*, **to notice** *(замечать)*, **to see, to feel** частица **to** перед инфинитивом опускается: The students **watched** the experienced **engineer demonstrate** the advantages of silica concrete. Студенты *наблюдали, как* опытный *инженер демонстрировал* преимущества силикатного бетона.

Объектный инфинитивный оборот переводится на русский язык сложным предложением с придаточным дополнительным предложением, которое вводится союзами *что, чтобы, как* и др. Причем существительное (или местоимение) переводится подлежащим придаточного предложения, а инфинитив — сказуемым: They **wanted** *the builders* **to improve** the quality of building constructions. Они **хотели,** *чтобы строители улучшили* качество строительных конструкций.

Инфинитив может выполнять функцию определения. В таких случаях он стоит после определяемого существительного: The article **to be translated** is not very difficult. Статья, *которую необходимо перевести*, не очень трудная.

Инфинитив в функции определения переводится определительным придаточным предложением, нередко с оттенком будущего времени

или долженствования: This is the branch of building engineering **to be taken into consideration.** Это область строительства, *которую необходимо принимать во внимание (должны принимать во внимание).*

В предложном обороте **for** + существительное (или **местоимение**) + **инфинитив с частицей «to»** глагол в форме инфинитива обозначает действие, которое выполняет предмет, выраженный существительным или местоимением, стоящим после **for.** Предложные обороты, как правило, переводятся на русский язык с помощью придаточного предложения, вводимого союзами *чтобы* и *для того, чтобы.* Существительное или местоимение в обороте с предлогом **for** переводится существительным или местоимением в функции подлежащего обстоятельственного придаточного предложения, а инфинитив — глаголом в личной форме, т.е. сказуемым: The bearing capacity of the ground was too low **for the builders to start the construction work of a 16-storeyed house.** Несущая способность грунта была слишком мала *для того, чтобы строители могли начинать сооружение 16-этажного здания.*

§ 46. Субъектный инфинитивный оборот (именительный падеж с инфинитивом). Субъектный инфинитивный оборот употребляется со следующими вводящими глаголами в пассивной форме: **is known** — *известно,* **is considered** — *считают,* **is stated** — *указывают,* **is reported** — *сообщают,* **is said** — *говорят,* **is supposed** — *предполагают,* **is expected** — *ожидают, полагают,* **is found** — *находят,* **is heard** — *слышно,* **is claimed** — *утверждают,* **is thought** — *думают,* **is assumed** — *допускают,* **is taken** — *полагают.* Например: **The weather is expected to become severe.** *Ожидают, что погода будет суровой.*

Субъектный инфинитивный оборот может употребляться с вводящими глаголами **to appear** — *оказываться,* **to prove** — *доказывать* и **to seem** — *казаться* в активной форме и словосочетаниями **is likely** — *очевидно, вероятно,* **is unlikely** — *невероятно,* **is sure** — *несомненно, безусловно* в качестве вводящих компонентов: **The beam seemed to be fixed.** *Балка, казалось, была защемленной.* **They are sure to know** how the high-rise apartment house was constructed in such a short period of time. *Они, несомненно, знают* о том, как в такой короткий срок был построен жилой высотный дом.

Как видно из примеров, эта конструкция, выраженная существительным в общем падеже или местоимением в именительном падеже с инфинитивом, переводится на русский язык сложно-подчиненным предложением. Сказуемое английского предложения при переводе на русский язык преобразуется в сказуемое главного предложения, представляющее собой неопределенно-личную форму (*считают, говорят* и т.д.); подлежащее **they** становится подлежащим русского придаточного предложения, а инфинитив — его сказуемым. Придаточное предложение в русском переводе вводится союзом *что.*

§ 47. Герундий (Gerund). По внешнему виду герундий совпадает с причастием I и отглагольным существительным, выражает название действия, которое представляется как процесс и переводится на русский язык: 1) отглагольным существительным; 2) неопределен-

ной формой глагола; 3) деепричастием; 4) придаточным предложением. В русском языке герундию ближе всего соответствуют отглагольные существительные с суффиксами *-(е)ние, -ство, -ка:* **spanning** — *перекрытие;* **cementing** — *цементирование;* **moving** — *движение;* **designing** — *проектирование;* **building** — *строительство, построение.*

Чтобы правильно перевести герундий, необходимо знать, какие функции он выполняет и как он сочетается с другими словами в предложении.

В предложении герундий может выполнять следующие функции: подлежащего, именной части составного именного сказуемого, части составного глагольного сказуемого, прямого и предложного дополнения, определения, обстоятельства.

В функции подлежащего герундий стоит в начале предложения, перед ним нет предлога, и переводится герундий существительным в именительном падеже или неопределенной формой глагола: **Speeding up** construction has been made possible through using all kinds of modern building equipment. *Ускорение* строительных работ (ускорить строительные работы) стало возможным благодаря использованию всех видов современного строительного оборудования.

В функции именной части составного именного сказуемого герундий следует за глаголом **to be** и переводится существительным или неопределенной формой глагола: The main task of the builders is **developing** a highly efficient method of apartment and industrial construction. Основная задача, стоящая перед строителями — *развитие* высокоэффективного метода строительства жилых и промышленных зданий. (Основная задача, стоящая перед строителями, *развивать* высокоэффективный метод строительства жилых и промышленных зданий.)

Как часть составного глагольного сказуемого герундий часто употребляется без предлога и следует за глаголами **to finish, to stop, to keep on, to go on** и прилагательными **worth** *(стóящий)*, **busy** *(занятый)* и т.п. They *finished* **placing** concrete. Они *закончили* **укладку** бетона. This case *is worth* **mentioning.** Этот случай *стоит* **упомянуть.** (Этот случай *стоит* **упоминания.**)

Герундий в функции прямого дополнения стоит после переходного глагола, в середине или в конце предложения и переводится существительным в винительном падеже или неопределенной формой глагола: They must improve **erecting** high-rise buildings. Они должны улучшить *возведение* высотных зданий.

Герундий в функции предложного дополнения употребляется после многих глаголов, прилагательных и причастий, требующих определенных предлогов. Он переводится на русский язык или неопределенной формой глагола, или существительным в косвенном падеже: Our cosmonauts succeeded **in solving** a series of most vital problems. Наши космонавты сумели *разрешить* целый ряд жизненно важных проблем. (Наши космонавты преуспели в *разрешении* целого ряда жизненно важных проблем.)

Герундий в функции определения употребляется с разными

предлогами. Наиболее употребительным является предлог **of**, который стоит после определяемого существительного и переводится существительным, отвечающим на вопросы *какой? чей? кого? чего?*: There are several ways **of placing** room-sized elements into position. Существует несколько способов *возведения* блоков-комнат.

Герундий в функции обстоятельства употребляется с предлогом и переводится существительным с предлогом, деепричастием или придаточным предложением: **Upon solving** a series of most urgent problems the cosmonauts commenced analysing the results. *После решения* целого ряда наиболее важных проблем, космонавты начали анализировать результаты. (*Решив* целый ряд ...).

§ 48. Сложноподчиненное предложение (The Complex Sentence). Как известно, придаточные предложения (Clauses) присоединяются к главному при помощи подчинительных союзов, союзных слов или бессоюзным способом, а к придаточным предложениям могут иногда присоединяться свои придаточные предложения.

1) Определить придаточные предложения-подлежащие (Subject Clauses) можно по союзам **that** *(то) что*, **whether** *ли*, **if** *ли*, а также по союзным словам **who(m)** *кто, кого*, **whose** *чей*, **what** *(то,) что, какой*, **which** *который*, **when** *когда*, **where** *где, куда*, **how** *как*, **why** *почему*.

That sandwich panels must be coated with an impermeable finish because of high humidity inside the building is quite clear. *То, что вафельные панели необходимо покрыть водонепроницаемой оболочкой из-за высокой влажности внутри помещения*, не вызывает никакого сомнения.

2) Если за глаголом-связкой главного предложения следует придаточное предложение (о чем можно судить по союзу или союзному слову), оно выполняет функцию именной части сказуемого и называется предикативным придаточным предложением (Predicative Clauses). Они соединяются с главным предложением теми же союзами и союзными словами, что и предложения-подлежащие.

The question is **whether concrete panels are suitable for use**... Вопрос состоит в том, *подойдут ли бетонные панели* ... .

Придаточные дополнительные предложения (Object Clauses) выполняют функции дополнения и отвечают на вопрос **what** *что* и вводятся союзами **that** *что*, **whether** *ли*, **if** *ли*, **when** *когда*, **why** *почему*, **how** *как* и т.д., т.е. дополнительное придаточное предложение вводится теми же союзами и союзными словами, что и придаточные предложения-подлежащие и сказуемые.

The figure indicates **that high horizontal tensile stresses develop along the lower edge of the beam.** Этот рисунок показывает, *что в нижнем конце балки возникают высокие упругие напряжения.*

Определительные придаточные предложения (Attributive Clauses) отвечают на вопрос: **which?, what?** *какой?* и вводятся в основном союзными словами: **who, whom, about whom, with whom** *который, которого, о котором, с которым;* **whose** *чей, который;* **which** *который;* **that** *который.*

The Soviet Union is the world's only industrial country **whose economic development is based on its own fuel and energy resources.** Советский Союз — единственная страна в мире, *экономическое развитие которой полностью основано на собственном топливе и энергии.*

В определительных придаточных предложениях союзные слова (местоимения **that, which**) могут быть опущены, если они не являются подлежащим определительного придаточного предложения.

Признаком бессоюзного подчинения определительного придаточного предложения являются два, контактно расположенных подлежащих (обычно два существительных или существительное и личное местоимение). За ними следуют два сказуемых, главного и придаточного предложений. Однако при переводе таких предложений на русский язык пропущенное союзное слово (на стыке двух существительных) восстанавливается: The game *(which)* **the sportsman is playing** is very fascinating. Игра, *в которую играет этот спортсмен*, очень увлекательная.

Обстоятельственные придаточные предложения (Adverbial Clauses) отделяются запятой от главного в том случае, если они предшествуют главному. Такие предложения могут выполнять функции обстоятельства времени, отвечая на вопрос **when?** *когда?*. Они присоединяются к главному предложению следующими союзными словами: **when** *когда;* **while** *в то время как, пока;* **as** *в то время как, по мере того как* и др. Придаточные предложения образа действия (Adverbial Clauses of Manner) вводятся при помощи союзов **as, as if, as ... as, not so ... as.** Придаточные предложения места (Adverbial Clauses of Place) отвечают на вопросы **where?** *где?* **where from?** *откуда?* и вводятся союзами where *где*, wherever *где бы ни, куда бы ни.*

Придаточные уступительные (Adverbial Clauses of Concession) вводятся следующими союзами и союзными словами: **though (although)** *хотя*, **whoever** *кто бы ни*, **whatever** *что бы ни.*

Обстоятельства причины (Adverbial Clauses of Cause) отвечают на вопрос **why?** *почему?* и вводятся союзами **because** *потому что*, **as** так как, **since** *поскольку*, **now that** *когда.*

Обстоятельства цели (Adverbial Clauses of Purpose) отвечают на вопрос **what for?** *для чего?* и вводятся словами **(so) that** *(так) чтобы, чтобы;* **in order that** *для того чтобы.*

Обстоятельства условия (Adverbial Clauses of Condition) вводятся союзами **if** *если*, **provided (that), (providing)** *при условии, если только*, **unless** *если только не*, **when** *если.*

Придаточные условные предложения могут вводиться и без союзов: Had I ... ; Were I ... ; Should I ... Глаголы **had, were, should,** стоящие в начале повествовательного предложения, служат признаком придаточных бессоюзных условных предложений. В русском языке таким предложениям соответствуют обычно предложения, начинающиеся союзом *если бы:* **Had precast concrete constructions been more widely used in seismic zones,** there would be less destructions.

§ 49. Выделение отдельных членов предложения при помощи оборотов типа It is (was) ... that (who) ...

Специальная конструкция **is (was) ... that (who, whom)** является признаком смыслового выделения члена предложения. Элементы оборота — **is (was) ... that (who)** на русский язык не переводятся. В соответствующих предложениях в русском языке тот член предложения, на который следует обратить внимание, выделяется интонацией, ударением или используются усилительные слова *именно*, *только* и т.д.: **It was** our Soviet chess player **who** won the world chess championship. *Именно* наш советский шахматист завоевал звание чемпиона мира по шахматам.

§ 50. Словообразование (Word-Building). Образование новых слов в английском языке происходит чаще всего посредством прибавления к корню приставок и суффиксов. Другим распространенным способом является словосложение, когда два или несколько корневых слов соединяются в одно составное или сложное: **earth** — *земля*, **quake** — *дрожание*, **earthquake** *землетрясение;* **lime** — *известь*, **stone** — *камень*, **limestone** — *известняк;* **brickwork** — *кирпичная кладка;* **lightweight** (concrete) — *облегченный бетон;* **man-made** — *искусственный*.

Словообразование происходит также путем чередования ударения: **'export** *(a)* — **to ex'port** *(v)*, **'subject** *(n)* — **to sub'ject** *(v)* и путем чередования звуков: **use** [ju:s] — **to use** [ju:z], **house** [haus] — **to house** [hauz].

Иногда от существующего слова образуется новое слово, относящееся к другой части речи, без изменения его звуковой или графической формы, путем конверсии.

От существительных могут быть образованы глаголы: **crack — to crack** *давать трещину;* **can — to can** *консервировать продукты;* **design — to design** *проектировать;* **result — to result (in)** *приводить(к)*.

Производными словами называются слова, образованные от основы с помощью суффикса или префикса. При раскрытии значения незнакомых производных слов устанавливают, какой суффикс оформляет это производное слово и к основе какой части речи он прибавлен.

Так, суффикс **-er**, прибавленный к основе глагола, является признаком производных существительных, обозначающих действующих лиц: reader, builder, designer.

$$v + \text{-er} = n$$

В русском языке таким существительным соответствует производное существительное с суффиксами *-тель*, *-щик*, *-ок*, *-ец*, *-ун*, и др.: builder — *строитель;* researcher — *исследователь;* player — *игрок;* planner — *планировщик;* runner — *бегун*.

Суффикс **-or**, прибавленный к основе глагола, выражает понятие производителя действия, обозначаемого глаголом, от основы которого образовалось новое слово: contractor — *подрядчик;* lubricator — *смазчик;* elector — *избиратель*.

$$v + \text{-or} = n$$

Суффикс **-ion(-ation)**, прибавленный к основе глагола, является признаком абстрактных существительных: cre**ation** — *создание*, demo**lition** — *разрушение*.

$$v + \text{-ion (-ation)} = n$$

Суффикс **-ness**, присоединенный к основе прилагательного, является признаком существительных, которые выражают значение качества, состояния или признака: water**tightness** — *водонепроницаемость;* hard**ness** — *твердость;* stiff**ness** — *жесткость;* dark**ness** — *темнота;* full**ness** — *полнота*.

$$adj + \text{-ness} = n$$

Суффикс **-ing**, прибавленный к основе глагола, является признаком производных существительных: cur**ing** — *вызревание бетона;* crack**ing** — *образование трещин;* mould**ing** — *формовка;* plac**ing** — *укладка*, pre-tension**ing** — *предварительное натяжение;* post-tension**ing** — *последующее натяжение*, prestress**ing** — *предварительное напряжение*.

$$v + \text{-ing} = n$$

Существительные с суффиксом **-ing** обычно переводят или производными существительными с суффиксами *-ние*, *-к(а)*, *-тие* и др., или словосочетаниями.

Суффикс **-ment**, прибавленный к основе переходных глаголов, является признаком абстрактных существительных: develop**ment** — *развитие;* reinforce**ment** — *армирование;* treat**ment** — *очистка;* require**ment** — *требование;* settle**ment** — *осадка*.

$$v + \text{-ment} = n$$

Суффикс **-age**, прибавленный к основе глагола, является признаком абстрактных существительных со значением результата действия: break**age** — *поломка;* shrink**age** — *усушка;* leak**age** — *утечка;* stor**age** — *хранение;* moor**age** — *место причала*.

$$v + \text{-age} = n$$

Суффикс **-ity**, прибавленный к основе прилагательного, является признаком производных существительных, выражающих состояние, положение, качество, свойство: durab**ility** — *стойкость;* rig**idity** — *жесткость;* ab**ility** — *способность;* dens**ity** — *плотность;* pur**ity** — *чистота;* acid**ity** — *кислотность;* equal**ity** — *равенство;* conduct**ivity** — *проводимость;* impermeab**ility** — *водонепроницаемость*.

$$adj + \text{-ity} = n$$

Суффикс **-ture(-sure)**, присоединенный к основе существительного, является признаком абстрактных существительных: moist**ure** — *влажность;* meas**ure** — *измерение;* architec**ture** — *архитектура;* manufac**ture** — *производство;* cul**ture** — *культура.*

$$\boxed{n + \text{-ture (-sure)} = n}$$

§ 51. Основные модели образования существительных.

Основа +	**-er(-or)**	builder, elector
	-er(-or)	computer, elevator
	-er	New Yorker, villager
	-ion(-ation)	interaction, creation
	-ness	stiffness
	-ing	placing
	-ment	reinfortement
	-ity	density
	-age	shrinkage
	-ture	structure, manufacture
	-(s)ure	closure, pleasure
	-ist	physicist

§ 52. Основные модели образования прилагательных.

Основа +	-ive	active, effective, compressive
	-ful	powerful, harmful
	-able	available, favourable, durable, valuable
	-ible	flexible, possible
	-ic	periodic, organic, synthetic
	-ish	bookish, greyish, reddish, coldish
	-ed	leaved, wooded, reinforced, prefabricated
	-y	grainy, healthy
	-al(-ial)	axial, partial, thermal
	-less	useless, weightless
	-ant (-ent)	important, different, convenient
	-en	wooden

un-	+ основа	uncomfortable, unusual, unequal
im-		impossible
in-		indirect, independent, inconvenient
ir-		irresistible

un + *adj* = *adj*

Суффикс **-ive**, прибавленный к основе глагола, является признаком прилагательных со значением «обладающий свойством, качеством»: impress**ive** — *производящий впечатление.*

v + **-ive** = *adj*

Суффикс **-ful**, прибавленный к основе существительного, является признаком производных прилагательных со значением «обладающий качеством»: beauty + **ful** = beauti**ful**

n + **-ful** = *adj*

Суффикс **-ish**, прибавленный к основе существительного, является признаком производных прилагательных, обозначающих принадлежность к тому, на что указывает существительное: book**ish** — *книжный.* Если же этот суффикс прибавляется к основе прилагательного, то он выражает понятие степени качества или признака: dry**ish** — *суховатый;* blu**ish** — *голубоватый;* wid**ish** — *широковатый.*

n + **-ish** = *adj*

adj + **-ish** = *adj*

Суффикс **-ed** является показателем производных прилагательных со значением «имеющий то, на что указывает существительное»: pre-fabricat**ed** — *заранее изготовленный, сборный;* reinforc**ed** — *армированный.*

adj + **-ed** = *adj*

Суффикс **-less**, прибавленный к основе существительного, является признаком производных прилагательных, обозначающих отсутствие соответствующего качества, свойственного существительному: harm**less** — *безвредный;* use**less** — *бесполезный;*

n + **-less** = *adj*

§ 53. Основные модели образования глаголов.

Основа +

-ize (-ise)	modern**ize** — *модернизировать*, stand-ard**ize** — *стандартизировать*
-fy	mod**ify** — *видоизменять*, pur**ify** *очищать*
-en	strength**en** — *укреплять;* length**en** — *удлинять;* wid**en** — *расширять*
-ate	loc**ate** — *размещать;* grad**uate** — *оканчивать вуз*, separ**ate** — *отделять*, loc**ate** — *располагаться*, gener**ate** — *производить*

+ основа

be-	**be**little — *умалять*, **be**set 1) *окружать;* 2) *украшать орнаментом*
re-	**re**build — *перестраивать;* **re**house — *переселять в новый дом*
dis-	**dis**charge — *разгружать*, **dis**order *приводить в беспорядок*
un-	**un**bend — *разгибать*, **un**fasten — *развязывать*
de-	**de**mobilize — *демобилизовать*
mis-	**mis**understand — *недопонимать*, **mis**calculate — *просчитаться*
over-	**over**load — *перегрузить*, **over**grow — *перерасти*
under-	**under**estimate — *недооценивать*
en-	**en**large — *увеличивать*
em-	**em**bark — *грузить на корабль*

§ 54. Раскрытие значения слов, образованных по конверсии. При конверсии от слов без изменения его формы образуется новое слово, относящееся к другой части речи: **cool** — *прохладный*, **to cool** — *охлаждать;* **heat** — *теплота*, **to heat** — *подогревать;* **water** — *вода*, **to water** — *увлажнять;* **load** — *нагрузка*, **to load** — нагружать.

На русский язык такие слова могут переводиться: 1) словами, образованными от общего русского корня, например: a **support** *опора, поддержка*, **to support** — *опираться, поддерживать;* a **project** *проект*, **to project** — *проектировать;* a **design** *проект*, **to design** — *проектировать.*

2) словами, образованными от общего (русского) корня, но отличающихся приставкой, например: **an end** — *конец*, **to end** — *заканчивать;* **narrow** — *узкий*, **to narrow** — *сужать;* **empty** — *пустой*, **to empty** — *опустошать.*

3) словами, которые образовались от разных корней: **an eye** — *глаз*, **to eye** — *смотреть;*

4) словосочетаниями: **a corner** — *угол*, **to corner** — *загонять в угол*; **to test** — *испытание, проверка, анализ*, **to test** — *подвергать испытанию, производить опыты.*

§ 55. Основные модели сложных слов

1)	$n + n = n$	**brickwork**	*кирпичная кладка*
2)	$n + n$ **-er** $= n$	**a stone-cutter** **a peace-lover**	*каменотес;* *сторонник мира*

В раскрытии значений подобных сложных существительных помогает осмысление их внутренней формы: **a cotton-grower** — *тот, кто выращивает хлопок, хлопкороб;* **a grain-grower** — *хлебороб.*

Сложные существительные этого типа обозначают приспособление, с помощью которого выполняется действие с предметом, выраженным первым компонентом: **a stone-mason** — *каменщик* (букв. *укладчик камней*); **a glass-cutter** — *стеклорез;* **an air-receiver** — *воздухоприемник.*

Такие сложные существительные на русский язык переводят также сложными существительными: **an air-heater** — *воздухоподогреватель:* **a fault-finder** — *прибор для отыскания ошибок.*

В раскрытии значений таких сложных существительных помогает осмысление их внутренней формы: **a break-water** — *волнолом* (то, обо что разбивается волна); **a stone-crusher** — *камнедробилка* (то, что дробит камень); **a gangway** — *сходни, мостки.*

3) $ger + n = n$

a heating-plant — нагревательная установка; **a polishing-tool** — устройство для полировки. На русский язык подобные сложные сущест-

вительные переводят словосочетаниями: **a freezing-test** — *испытание на морозостойкость.*

Сложные прилагательные типа **water-proof** — *водонепроницаемый* образованы путем сложения двух компонентов, из которых первый элемент выполняет ограничительную функцию: **water-tight** — *водонепроницаемый*, **air-tight** — *воздухонепроницаемый;* **air-free** — *свободный от воздуха;* **acid-free** — *свободный от кислоты;* **crack-free** — *свободный от трещин, без трещин;* **heatproof** — *жаронепроницаемый;* **shock-proof** — *противоударный;* **vapourtight** — *паронепроницаемый.*

На русский язык подобные прилагательные переводят или сложными прилагательными (см. вышеприведенные примеры), или словосочетаниями: **pollution-free** — *свободный от загрязнения;* **friction-free** — *свободный от трения;* **noise-proof** — *не пропускающий шум;* **air-absorbing** — *непроницаемый для загрязненной атмосферы;* **sound-absorbing** — *звукопоглощающий.*

4) $\boxed{n + \text{I-ing} = adj}$

Сложные прилагательные этого типа образованы путем сложения двух компонентов (основы существительного и основы причастия I): **heat-removing** — *теплоизолирующий;* **sound-absorbing** — *звукопоглощающий.* Они переводятся на русский язык также сложными прилагательными или словосочетаниями: **load-bearing** — *несущий нагрузку;* **oil-bearing** — *нефтеносный;* **acid-containing** — *содержащий кислоту.*

5) $\boxed{n + \text{II-ed} = adj}$

sun-dried — *высушиваемый на солнце.* На русский язык такие сложные прилагательные переводят словосочетаниями: **metal-covered** — *с металлическим покрытием;* **heat-treated** *обрабатываемый теплом;* **right-angled** — *прямоугольный;* **obtuse-angled** — *тупоугольный.*

6) $\boxed{adj + n + \text{-ed} = adj}$

О значении сложных прилагательных, образованных из основы существительного и основы прилагательного, можно догадаться из значений составляющих их элементов: **long-nosed** — *длинноносый.* Они переводятся также сложными словами: **kind-hearted** — *добросердечный;* **soft-hearted** — *мягкосердечный.*

АНГЛО-РУССКИЙ СЛОВАРЬ

A

abrasion *n* шлифовка, истирание, механическое повреждение поверхности
access *n* доступ, подход, проход, добавление; **access corridor** технический коридор для размещения трубопроводов; **access eye** очистное отверстие; ревизия
accessible *a* доступный
adapt *v* применять, приспособлять
advertisement *n* реклама
air-cock *n* продувочный краник
aircraft hangar ангар для самолетов
anti-clockwise *a* движущийся против часовой стрелки
apartment *n* квартира; **apartment house** жилой дом
A-pole *n* А-образная опора
apparent *a* кажущийся
appear *v* 1) появляться; 2) казаться
appearance *n* 1) внешний вид; 2) появление
application *n* применение
apply *v* применять(ся), относиться к (to)
approach *n* подступ, доступ
appropriate *a* подходящий; уместный
approval *n* одобрение, утверждение
approve *v* одобрять, утверждать
approximate *adv* приблизительный
arch *n* арка, свод
archway *n* проход под аркой
area *n* площадь, район
arid *a* засушливый; безводный
arise (arose, arisen) *v* 1) возникать; 2) проистекать; 3) подниматься
arm *n* 1) рука; 2) плечо *(рычага)*
armament *n* вооружение
arms *(pl)* *n* оружие
arrangement *n* устройство
art *n* искусство
article *n* 1) статья; 2) предмет
artificial *a* искусственный
as *adv* как; в качестве 1) в то время как; 2) так как; **as ... as** так же ... как; **as far as** насколько; **as soon as** как только; **as for, as to** что касается; **as well** также
ash-pit *n* зольник
assemble *v* 1) собирать(ся); 2) монтировать
assembly *n* сборка; монтаж; **pre-assembly** предварительная сборка, заводская сборка
assign *v* назначать, определять
assist *v* помогать, содействовать
assistance *n* помощь, содействие
assuage *v* успокаивать, смягчать
assume *v* предполагать, допускать
attempt *n* попытка; *v* пытаться
attention *n* внимание
attorney *n* поверенный, адвокат
attract *v* привлекать, притягивать
attraction *n* притяжение, тяготение
author *n* автор
authorities *n* власти
automate *v* автоматизировать
auxiliary *a* вспомогательный
available *a* пригодный; наличный, имеющийся в распоряжении; действительный
average *a* средняя величина
avoid *v* избегать
axis *n* геометрическая ось
axle *n* ось

B

back *v* давать задний ход
backwash *n* обратная промывка
bad *a* плохой, испорченный
badly *adv* 1) плохо; 2) очень
baffle *n* преграда, щит
band *n* лента, полоса
bank *n* насыпь, вал
bar *n* стержень
barrage *n* заграждение, дамба, плотина с затворами
base *n* основание; *v* основывать
basement *n* подвал, основа, фундамент
basin *n* бассейн
bas-relief *n* барельеф
bay *n* пролёт между колоннами
beach *n* берег
beam *n* балка
bear (bore, borne) *v* поддерживать, подпирать, носить; **bear in mind** помнить; иметь в виду

bearing *n* опора
because *cj* потому что; **because of** из-за, вследствие
bed *n* основа, фундамент
bedrock *n* коренная порода, почва
belong *v* принадлежать
bend (bent, bent) *v* изгибаться; *n* колено; изгиб, поворот, загиб
bending *n* изгиб
beside *prep* рядом, около
besides *prep* кроме, кроме того
between *prep* между
bib *n* верхняя часть фартука
bib-cock *n* кран с загнутым вниз носиком
bind (bound, bound) *v* 1) связывать; 2) скреплять
binder *n* переплетчик
blade *n* лезвие
blanket *n* покрытие, поверхностный слой, покров
blast *v* взрывать
block *n* блок, квартал, здание, дом *(многоквартирный)*; **block of flats** многоквартирный дом
blow *n* удар; дутье
board *n* доска
body *n* тело, корпус
boil *v* кипеть; *n* кипение; точка кипения
boiler house *n* котельная
bond *n* соединение, спайка
boom *n* стрелка крана
border *n* граница, край
boring *n* бурение, зондаж; **boring well** буровая скважина
bottom *n* 1) дно, низ; 2) основа, фундамент
branch *n* 1) ветвь; 2) отрасль
break (broke, broken) *v* разбивать, разрушать
breakdown *n* поломка механизма, авария
breakthrough *n* 1) эпохальное открытие; 2) переворот *(в науке)*
breakwater *n* волнолом
brick *n* кирпич
bricklayer *n* каменщик
brickwork *n* каменная (или кирпичная) кладка
bright *a* яркий, светлый
bring (brought, brought) *v* приносить, привозить; **bring about** осуществлять; **bring down** снижать
brittle *a* хрупкий
broad *a* широкий; обширный
broaden *v* расширять
broadcast *v* передавать по радио
broadly *adv* пространно
brush *v* чистить
bucket *n* черпак, ковш, ведро
build (built, built) *v* строить, сооружать
built-in *a* встроенный
bulk *n* масса, объем
burn (burnt, burnt) *v* гореть, обжигать
burst (burst, burst) *v* взрывать
busy *a* занятый
but *n* торец; *v* располагать впритык
buttress *n* подпора, контрфорс
buy (bought, bought) *v* покупать
by-pass *n* обходной канал, приливной канал
by-passage *n* обходной канал
by-street *n* переулок

C

calculate *v* вычислять
calculation *n* вычисление, расчет
call *v* 1) называть; 2) вызывать; призывать; **call for** требовать
cancel *v* анулировать, отменять
canopy *n* навес, балдахин
canteen *n* столовая на месте работ
cantilever *n* консоль, наклонная подпора
canvas *n* парусина, холст, брезент
canyon *n* каньон
cap *n* капитель колонны; насадка
capable *a* способный
capability *n* способность
capacity *n* вместимость, емкость; **capacity load** полная нагрузка
capital *a* главный, основной; *n* 1) капитал; 2) столица
car *n* автомобиль, вагон; **car park** стоянка машин
carbon *n* углерод
carbon dioxide *n* углекислый газ
carpenter *n* столяр
carpentry *n* плотничные работы
carry *v* 1) везти, перевозить; 2) проводить; **carry on** продолжать; **carry out** выполнять
case *n* случай, обстоятельство; **in case** в случае; **in the case** что касается, в отношении
casing *n* опалубка
cast (cast, cast) *v* отливать *(о бетоне)*; **cast iron** чугун
catcher *n* улавливающее приспособление
catchment area водосборная площадь
catchment basin водосборный бассейн, общая площадь питания реки или озера
cater (for) *v* обслуживать, поставлять провизию
caterpillar *n* гусеничный ход

cause *n* причина; *v* причинять, вызывать
cave *n* впадина
cavern *n* пещера
cavity *n* впадина, трещина в породе, полость
cavitation *n* кавитация
cell *n* отсек
cellar *n* погреб
cementation *n* цементирование
century *n* век, столетие
certification *n* удостоверение
championship *n* чемпионат
chance *n* 1) случай, случайность; 2) возможность; **by chance** случайно
change *n* изменение; *v* изменять
channel *n* 1) канал; 2) желоб, выемка
charge (with) *v* нагружать, заряжать
cfs = cubic feet per second кубических футов в секунду
cheap *a* дешевый
cheaply *adv* дешево
chemistry *n* химия
chimney камин, дымоход
china *n* фарфор; **china clay** каолин
choose (chose, chosen) *v* выбирать
chute *n* желоб, мусоропровод
circle *n* круг
city congestion перенаселенность города
civil *a* гражданский
cladding *n* заполнение каркаса
claim *v* требовать
clay *n* глина
clean *a* чистый; *v* очищать
clear *a* 1) ясный; 2) свободный; *v* очищать
clever *a* 1) способный; 2) умный
clinker *n* клинкер
clip *n* зажим
cloakroom *n* раздевальня, гардероб
clock *n* часы
close *a* 1) близкий; 2) плотный; **close by** близко, около
coach *n* тренер
coal *n* уголь
coarse *a* грубый
coat *n* облицовка; **coat of paint** слой краски
coated *a* облицованный
code *n* кодекс, свод законов; **building code** строительные нормы
cofferdam *n* водонепроницаемая камера
cohesion *n* сцепление
cold *a* холодный; *n* холод
collapse *v* рушиться, выходить из строя
collar *n* втулка; кольцо; подшипник; обруч; хомут(ик); сальник
collect *v* собирать
combat *n* схватка, столкновение
combine *n* комбинат; **housebuilding combine** домостроительный комбинат
combustible *a* горючий
combustion *n* горение
come (came, come) *v* приходить, приезжать
comfortable *a* удобный
common *a* общий, распространенный; **in common** совместно
commonly *adv* обычно
communicate *v* связывать
communication *n* сообщение, связь
compare *v* сравнивать; **as compared with** по сравнению с
comparison *n* сравнение
competence *n* компетенция, умение
competition *n* 1) конкуренция; 2) соревнование
compile *v* компилировать, составлять
complaint *n* недовольство, жалоба
complete *a* полный; *v* заканчивать, завершать
completely *adv* совершенно, полностью
composition *n* состав, соединение
compress *v* сжимать
compressibility *n* сжимаемость
compression *n* сжатие
compute *v* вычислять
conclude *v* 1) решать, делать вывод; 2) заключать
conclusion *n* 1) заключение; 2) вывод
concrete *n* бетон; *v* бетонировать; **hollow-section concrete** пустотелый бетон; **in-situ concrete** монолитный бетон, бетон уложенный на стройке; **prestressed concrete** предварительно напряженный бетон; **reinforced concrete** армированный бетон
condition *n* условие; **on condition** при условии; **under such conditions** при таких условиях (обстоятельствах)
conditioned *a* обусловленный
conditioning *n* регулирование влажности и температуры
conduct *v* 1) вести; 2) руководить *(делом)*
conduit *n* трубопровод, водовод (подземный); акведук
cone *n* конус
confirm *v* подтверждать
conjunction *n* соединение
connect *v* соединять(ся)
conscientious *a* сознательный
conservation *n* консервирование
consider *v* принимать во внимание
considerable *a* значительный, важный
consideration *n* 1) внимание; 2) соображение; **to take into consideration** принимать во внимание

consist (of) *v* состоять *(из)*
consolidate *v* 1) укреплять(ся); 2) затвердевать
constancy *n* константа, постоянство
constant *a* постоянный
constituent *n* составная часть
constraint *n* скованность, напряженность
construct *v* строить
construction *n* строительство, строение
consumption *n* потребление, расход
contain *v* содержать, вмещать
contaminate *v* загрязнять
continue *v* продолжать
continuous beam *n* непрерывная балка
contribute *v* содействовать, способствовать
convenience *n* удобство
convenient *a* удобный
cool *a* прохладный; *v* охлаждать
copper *n* медь
copy *n* 1) копия; 2) рукопись; *v* подражать, переписывать
core *n* сердцевина
corner *n* угол
corps *n* корпус
correct *a* правильный, точный; *v* исправлять
correspond *v* соответствовать
correspondence *n* соответствие, переписка; **correspondence course** заочные курсы; **study by correspondence** учиться заочно
corrugate *v* морщиться
cost *n* цена, стоимость; **(cost, cost)** *v* стоить
council *n* совет
count *n* счет; *v* 1) считать; 2) полагать
country *n* страна
couple *v* соединять, спаривать; *n* пара
course *n* ход, течение
cover *v* покрывать; *n* покрышка
crack *n* трещина; *v* трескаться
cramp *n* скоба
crane *n* кран
create *v* создавать, творить
creep *v* ползти
creepage *n* ползучесть
crush *v* дробить
cupola *n* купол, свод
curb *n* обочина, бровка
current *n* 1) ток; 2) течение, поток
cut (cut, cut) *v* резать, отрезать
cutting *n* резка
cycling track велотрек
cylinder *n* цилиндр; валик; барабан

D

daily *adv* ежедневно; *a* ежедневный
dam *n* насыпь, дамба; **concrete face rockfill dam** насыпная дамба; **masonry arch dam** каменная арочная (дамба) плотина; **multiple-dome dam** многоярусная (дамба) плотина
damage *n* повреждение, ущерб, урон; *v* повреждать
damp *a* влажный, сырой; *v* смачивать, увлажнять
danger *n* опасность
dangerous *a* опасный
dark *a* темный
darken *v* затемнять
data *(pl)* *n* данные
date *n* дата, число; **out of date** устаревший; **up-to-date** современный, новейший
deal (dealt, dealt) (with) *v* иметь дело (с); **a good deal** много; **a great deal** много
decade *n* десятилетие
decay *n* разрушение; *v* разрушаться, гнить
decide *v* решать
decision *n* решение
deck *n* настил, покров
decking *n* покрытие
declare *v* объявлять
decorate *v* украшать
decrease *v* уменьшать, понижать
deepen *v* углублять(ся), погружать
defence *n* защита, укрепление
defend *v* оборонять, защищать
deficiency *n* недостаток
define *v* определять
definite *a* определенный
definition *n* определение
deflection *n* отклонение
degree *n* 1) степень; 2) градус
delay *v* задерживать, откладывать
deliver *v* доставлять
delivery *n* доставка
demand *n* требование; *v* требовать
demonstrate *v* показывать
dense *a* густой, плотный
density *n* плотность, густота
department *n* отдел
depend *v* 1) зависеть; 2) полагаться
dependent *a* зависимый
deposit *v* отлагать; *n* отложение
depth *n* глубина
desalination *n* опреснение
describe *v* описывать
description *n* описание
design *n* чертеж, конструкция, проект; *v* конструировать, проектировать
designate *v* обозначать
desire *v* желать
desperate *a* отчаянный, безнадежный
despite *prep* несмотря на
destroy *v* разрушать
destruction *n* разрушение

deteriorate *v* изнашивать(ся); портить(ся)
determine *v* устанавливать, определять
develop *v* 1) развивать(ся); 2) разрабатывать; 3) совершенствовать
development *n* 1) развитие; 2) усовершенствование
device *n* приспособление, механизм
devote *v* посвящать
differ *v* отличаться, различаться
difficult *a* трудный
difficulty *n* трудность, затруднение
dig (dug, dug) *v* копать, рыть
dimension *n* измерение; *n (pl)* величина, размеры
diminish *v* уменьшать
direct *v* управлять, направлять; *a* прямой, непосредственный
direction *n* направление, указание
directly *adv* прямо, непосредственно
disadvantage *n* недостаток, ущерб
disappear *v* исчезать
discharge *v* разгружать, опоражнивать; *n* выделение, выпускание, спуск, опоражнивание; **discharge of ground water** выход на поверхность грунтовых вод
discover *v* делать открытие, обнаруживать
discuss *v* обсуждать
displace *v* 1) перемещать; 2) смещать
display *v* показывать, обнаруживать
disregard *n* равнодушие, игнорирование
distance *n* расстояние
distant *a* далекий, отдаленный
distinguish *v* различать, выделять
distribute *v* распределять
disturbance *n* беспокойство, волнение
district *n* район, округ, участок
ditch *n* канава, ров, яма
divert *v* отклонять, отводить
divide *v* делить, разделять
division *n* деление, разделение
do (did, done) *v* делать
dock *n* док
dome *n* купол, свод
double *a* двойной; *v* удваивать
down *adv* вниз(у)
downstairs *a* нижний, расположенный в нижнем этаже
downward(s) *adv* книзу
drain *v* дренировать, осушать; **to drain away** вытекать; выпускать воду; выкачивать; **drain cock** спускной кран (сливной кран); **drain hole** отверстие для опорожнения; **drain plug** пробка выпускного отверстия
draught *n* поток *(воды)*; порция; некоторое количество
draw (drew, drawn) *v* 1) чертить; 2) тащить; 3) рисовать; **to draw up** составлять *(документ)*
drawback *n* 1) недостаток; 2) помеха
drawing *n* рисунок, чертеж
dredge *n* драга, землечерпалка
dredger *n* многочерпаковый экскаватор
dress *v* одеваться; *n* платье, одежда
dressing room гардеробная
drilling *n* бурение
drive (drove, driven) *v* 1) управлять; 2) приводить в движение; 3) вбивать
driver *n* водитель
drop *v* 1) ронять; бросать; 2) опускать; *n* капля
drought *n* засуха
dry *a* сухой; *v* 1) сушить; 2) сохнуть
durability *n* 1) долговечность; 2) износостойкость
due *a* должный, надлежащий; **due to** благодаря, вследствие; **in due time (course)** в свое время (должным порядком)
durability *n* 1) прочность; 2) длительность
during *prep* в течение, в продолжение
dust *n* пыль; *v* стирать, смахивать *(пыль)*
duty *n* долг, обязанность; **to be on duty** дежурить
dwelling *n* жилище, дом

E

each *a* каждый; **each other** друг друга
ear *n* 1) ухо; 2) колос
early *a* ранний; *adv* рано; **as early as** еще в
earth *n* земля
earthen *a* земляной, глиняный
earthquake *n* землетрясение
east *n* восток
easel *n* мольберт
eastern *a* восточный
easy *a* легкий
eave *n* карниз
ebb *n* отлив; **ebb and flow** прилив и отлив
economy *n* 1) хозяйство; 2) экономия, бережливость
edge *n* край
effect *n* действие; *v* осуществлять, производить; **in effect** в действительности; **to this effect** для этой цели
efficiency *n* 1) производительность; 2) полезное действие; коэффициент полезного действия
efficient *a* продуктивный
effort *n* усилие
either *a* один из двух, любой; **either ... or** или ... или

elect *v* избирать
elevation *n* возвышение
elevator *n* грузоподъемник
eliminate *v* устранять, исключать
elongate *v* растягивать, удлинять
embed *v* внедрять
embrace *v* охватывать, включать
emphasize *v* подчеркивать
employ *v* применять, использовать
employment *n* 1) применение; 2) служба
empty *a* пустой
enable *v* давать возможность
enclose *v* заключать, окружать
end *n* конец; *v* кончать; **to bring to an end** закончить, завершить; **to that end** для этой цели
engage *v* нанимать
engaged *a* занятый
engine *n* мотор, двигатель
engineering *n* техника
enlarge *v* 1) увеличивать(ся); 2) расширять(ся)
enough *a* достаточный; *adv* достаточно
ensure *v* обеспечивать, гарантировать
entail *v* влечь за собой
enter *v* входить
enterprise *n* предприятие
entrance *n* вход
enumerate *v* перечислять
environment *n* среда
equal *a* равный; *v* равняться
equality *n* равенство
equally *adv* равно, одинаково
equestrian *a* конный
equilibrium *n* равновесие
equip *v* оборудовать
erect *v* сооружать, воздвигать
error *n* ошибка
escape *v* избежать; *n* выпуск, выход
especial *a* особенный, специальный
especially *adv* специально, по существу
essential *a* существенный, неотъемлемый
essentially *adv* по существу
establish *v* основывать, устанавливать
establishment *n* 1) введение; 2) учреждение;
estimate *v* 1) устанавливать; 2) оценивать
evaluate *v* оценивать
evaporate *v* испарять(ся)
even *adv* даже; *a* равный
evenly *adv* рано
event *n* случай, событие; **in the event of** в случае
eventually *adv* в конечном счете
ever *adv* когда-либо; **ever since** с тех пор
evidence *n* доказательство
evident *a* очевидный
evidently *adv* очевидно
exact *a* точный
exactly *adv* точно
examine *v* исследовать
examination *n* исследование
exceed *v* превышать, превосходить
excellence *n* высокое качество, выдающееся мастерство
excellent *a* отличный, превосходный
except *prep* исключая; *v* исключить
exception *n* исключение; **with the exception of** за исключением
exceptional *a* исключительный
excess *n* избыток, излишек
excessive *a* чрезмерный
exchange *n* обмен; *v* обменивать
exhibit *v* экспонировать(ся) на выставке
exhibition *n* выставка
exist *v* существовать
existence *n* существование
expand *v* расширять(ся), увеличивать (ся) *(в объеме)*
expansion *n* расширение
expect *v* ожидать
expensive *a* дорогой
experience *n* опыт; *v* испытывать
explain *v* объяснять
explode *v* взрывать(ся)
expose *v* 1) подвергать действию; 2) выставлять
express *v* выражать
extend *v* 1) расширять; 2) распространять
extension *n* расширение
exterior *a* внешний, наружный
external *a* 1) наружный, внешний; 2) внешний *(о политике, торговле)*
extreme *a* крайний; *n* крайняя степень
extremely *adv* чрезвычайно

F

fabrication *n* производство
fabrics *n* ткань
face *n* 1) лицо; 2) фасад; *v* 1) облицовывать; 2) стоять лицом к лицу
facility *n* 1) способность; 2) легкость; *pl* удобства; возможности; оборудование; **athletic facilities** спортивные сооружения
fact *n* факт; **in fact** в действительности; **the fact is** ... дело в том, что ...
fail *v* потерпеть неудачу
failure *n* 1) повреждение; 2) неудача, провал
fall (fell, fallen) *v* падать; *n* падение
famine *n* голод
famous *a* знаменитый

far *adv* далеко; **as far as** насколько; **so far as** поскольку; **so far** пока
fast *adv* быстро, часто, скоро
fasten *v* прикреплять, укреплять
fatigue *n* износ
faucet *n* водопроводный кран
fault *n* недостаток, дефект
favour *n* благосклонность, одобрение; **in favour of** за, в защиту, в пользу
favourable *a* подходящий, удобный
feasible *a* выполнимый, осуществимый
feature *n* характерная черта, особенность
feel (felt, felt) *v* чувствовать, испытывать
feeling *n* чувство, ощущение
fence *v* ограждать; *n* забор; изгородь
ferroconcrete *n* железобетон
few *a* немного, мало; **a few** несколько
field *n* 1) поле; 2) сфера деятельности
figure *n* 1) цифра; 2) рисунок; *v* изображать
fill *v* наполнять
final *a* окончательный
finally *adv* в заключение, наконец
fine *a* с тонким концом, острый
finish *n* последний слой
fittings *n* фитинги; принадлежности, детали
fix *v* укреплять, прикреплять; налаживать
flare *n* вспышка, сигнальная ракета
flat *a* плоский
flat-plate *a* листовой; плоский
flexibility *n* эластичность, упругость
fluid *a* жидкий, текучий
foot *n* опора, основа
footing *n* фундамент, основа
force *n* сила, мощность
forecast *v* предсказывать, предвидеть
foreign *a* иностранный
foreman *n* прораб
forging *n* ковка *(процесс)*
forget (forgot, forgotten) забывать
form *n* форма; *v* образовывать
formulate *v* формулировать
forward *a* передний
found *v* основывать
foundation *n* фундамент, основание
fraction *n* дробь, частица
fracture *n* раздробление
fragile *a* хрупкий
framework *n* каркас
free *a* свободный; *adv* свободно; *v* освобождать
freedom *n* свобода
freeze (froze, frozen) *v* замораживать, замерзать
frequent *a* частый, часто встречающийся; *v* часто посещать
frequently *adv* часто, постоянно
fresh *a* 1) свежий; 2) новый
friction *n* трение
front *n* 1) передняя сторона; 2) фасад; **in front of** впереди
fruitful *a* плодотворный
fulfil *v* выполнять
fulfilment *n* выполнение, осуществление
full *a* полный, целый
fully *adv* совершенно, полностью
function *n* функция, значение; *v* функционировать
fundamental *a* основной
further *adv* дальше; *a* дальнейший; *v* содействовать
future *n* будущее; *a* будущий
furniture *n* фурнитура; оконный *или* дверной проем

G

gain *v* 1) получать; 2) выигрывать
gantry *n* стрела экскаватора
gate *n* ворота
gateway *n* вход, ворота
gather *v* собирать
general *a* 1) общий; 2) обычный, 3) главный; **in general** вообще
generally *adv* обычно, вообще
get (got, got) *v* получать, доставлять, добывать
girder *n* балка, ферма
glass *n* 1) стекло; 2) стакан
glue *v* клеить
glazier *n* стекольщик
go (went, gone) *v* 1) идти, ходить; 2) ехать, поехать; **go on** продолжать
gold *n* золото
goods *n* товары
govern *v* управлять
government *n* правительство
grade *n* 1) степень; 2) градус; 3) качество; *v* сортировать
gravel *n* щебень
gravitate *v* притягивать
gravity *n* земное притяжение
greenhouse *n* теплица, парник
gridiron *n* решетка
grillage *n* железная решетка
groove *n* желобок, выемка
ground *n* земля; *v* положить основание
grout *n* жидкое цементное тесто
grow (grew, grown) *v* расти
growth *n* рост
guard *v* охранять, защищать; *n* охрана
guide *v* руководить, вести; *n* ориентир, указатель
gulf *n* морской залив
gush *v* литься потоком, нестись стремительно

gutterway *n* водоотводная канава
gypsum *n* гипс

H

half *n* половина
hand *n* 1) рука, кисть руки; 2) стрелка *(часов и т. д.)*; *v* передавать, вручать; **by hand** ручным способом; **on the one hand** с одной стороны; **on the other hand** с другой стороны
happen *v* случаться
hard *adv* сильно, интенсивно, твердо, крепко; *a* крепкий
harden *v* затвердевать
hardening *n* затвердевание
hardly *adv* едва
hardness *n* твердость, прочность
hardpan *n* затвердение подпочвенного пласта
H-beam двутавровая балка
head *n* 1) голова; 2) верхняя часть *(чего-л.)*; 3) глава; 4) руководитель
headwaters *n* главный водосбор
heart *n* сердце
heat *n* тепло; *v* 1) нагревать; 2) отапливать
heating *n* 1) отопление; 2) нагревание
heat-radiating *a* теплоизлучение
heavy *a* 1) тяжелый; 2) сильный
help *n* помощь; *v* помогать
helpful *a* полезный
high *a* высокий
highness *n* высота
highly *adv* чрезвычайно
highway *n* дорога, шоссе
hire *v* брать напрокат, нанимать
hoarding *n* временное ограждение
hoist *n* подъемник
hold (held, held) *v* держать
hole *v* пробивать отверстие; *n* дыра, отверстие
hollow *a* пустой, полый
home *n* дом, жилище
homogeneity *n* однородность
homogeneous *a* однородный; гомогенный
hook *n* 1) скобка; 2) крюк, крючок
hope *n* надежда; *v* надеяться
hopper *n* бункер
horizontal bar перекладина, турник
hornbeam *n* граб
horsepower *n* лошадиная сила; **actual horsepower** эффективная мощность; **water horsepower** теоретическая мощность турбины
house *n* дом; *v* поместить, вмещать; **pre-cast concrete house** дом из предварительно напряженного бетона
however *adv* однако
hue *n* оттенок, цвет
huge *a* огромный
human *a* человеческий; **human being** человек
humidity *n* влага
hydraulic *a* гидравлический
hydraulics *n* гидравлика
hydrology *n* гидрология

I

ice *n* лед
idea *n* 1) мысль; 2) идея, представление
i. e. (id est) т. е. (то есть)
identification *n* определение
illumination *n* освещение
imagine *v* воображать, представлять себе
immediate *a* непосредственный
immediately *adv* 1) немедленно; 2) непосредственно
immense *a* огромный
impact *n* удар
impair *v* повреждать
impediment *n* помеха, затруднение
impetus *n* толчок, импульс
imporosity *n* структура без пор
important *a* важный
impossible *a* невозможный
impound *v* запруживать воду
impregnate *v* пропитывать, насыщать
impress *v* усиливать, укреплять
improve *v* улучшать
improvement *n* улучшение
impurity *n* примесь
inadequate *a* несоразмерный
inch *n* дюйм (= 2,54 см)
inclination *n* наклон
include *v* включать
inconstant *n* переменная величина
incorporate *v* 1) объединять; 2) включать
incorporation *n* объединение
increase *v* увеличивать(ся); *n* увеличение
indeed *adv* в самом деле
indefinite *a* неопределенный, неограниченный
independence *n* независимость
indicate *v* указывать, означать
industrial *a* промышленный
industry *n* промышленность
inequality *n* неравенство
inflammable *a* легко воспламеняющийся
influence *n* влияние, действие; *v* влиять
inform *v* сообщать
information *n* сообщение
inhabitant *n* житель
initial *a* первоначальный

initially *adv* первоначально
injection *n* впрыскивание, инъекция
inner *a* внутренний
innovation *n* 1) нововведение, новшество; 2) новаторство
innumerable *a* бесчисленный
insert *v* вставлять, вкладывать
inside *adv* внутри; *n* внутренняя сторона
insist *v* настаивать
inspect *v* осмотреть
inspection *n* осмотр
install *v* устанавливать
installation *n* установка, монтаж
instead *adv* вместо
institution *n* учреждение
insulation *n* изоляция
insure *v* обеспечивать
intake *n* всасывающее отверстие
intensify *v* усиливать
intention *n* намерение
interception *n* преграда
interfere *v* вмешиваться
interference *n* вмешательство
interior *a* внутренний
intermediate *a* промежуточный
intermittent *a* прерывающийся, прерывистый
internal *a* внутренний
interrupt *v* прерывать
interruption *n* перерыв, остановка
introduce *v* вводить, вставлять
introduction *n* введение
invent *v* изобретать
invest *v* вкладывать
investigate *v* исследовать
investigative *a* исследовательский
invite *v* приглашать
involve *v* 1) включать в себя; 2) вовлекать, впутывать
ionic *a* ионический
iron *n* железо; *a* железный
irregular *a* неправильный; несимметричный
island *n* остров
isolate *v* изолировать
issue *n* 1) издание, выпуск; 2) спорный вопрос
item *n* 1) вопрос в повестке дня; 2) отдельный предмет *(в списке и т. д.)*

J

jack *n* подъемное устройство
jacket *n* изоляция, кожух
jam *v* сжимать
jamming *n* загромождение
jaw-breaker *n* челюстная дробилка
jet *n* струя
jetting *n* гидравлическое зондирование
jetty *n* мол, насыпь
job *n* работа
join *v* соединять
joiner *n* столяр
joint *n* соединение
joist *n* брус, балка; стропило
judge *v* судить
judgement *n* мнение
junction *n* соединение; место соединения
jump *v* прыгать
just *adv* только что
justify *v* подтверждать

K

keep (kept, kept) *v* держать, иметь, хранить
key *n* ключ; **key industries** ведущие отрасли промышленности
kind *n* 1) род; 2) вид, сорт
knee *n* угольник, колено
knife *n* нож
knock *v* ударять; стучать; *n* стук, толчок; **to knock a house down** снести дом
know-how *n* умение; знание дела
knowledge *n* знание

L

labour *n* труд, работа; **manual labour** физический труд
lack *n* недостаток; *v* не хватать
ladder *n* лестница *(приставная)*
laminate *v* обшивать металлическим листом
lamination *n* обшивка, наслоение
land *n* земля, суша; *v* высаживаться, приземляться
last *a* последний, прошлый; **last year (month, week)** в прошлом году (месяце, на прошлой неделе); **last night** вчера вечером; **at last** наконец
late *a* последний, недавний; *adv* поздно
lateral *a* боковой
lath *n* дранка
law *n* закон, правило
lay (laid, laid) *v* класть, положить; **to lay out** планировать; **to lay the foundation** заложить фундамент
lay-out *n* планировка сооружения; план; генеральный план; проектная схема; организация работ; разбивка, разметка
lead *n* свинец
lead (led, led) *v* вести, руководить
league *n* союз
leakage *n* утечка, фильтрация
leave (left, left) *v* оставлять, покидать
length *n* длина

lengthen *v* удлинять
let (let, let) *v* пускать, позволять; **let in** впускать
let out выпускать
level *n* уровень
liable *a* подверженный, склонный, расположенный
lie (lay, lain) *v* лежать
lift *n* подъем; *v* поднимать
light *n* свет; *v* освещать
lighthouse *n* маяк
lightweight *a* легковесный
like *v* нравиться; *a* подобный
likely *adv* вероятно
lime *n* известь
limestone *n* известняк
limit *n* предел; *v* ограничивать
limitation *n* ограничение
line *n* линия, ряд; *v* выстраивать в ряд
link *n* звено, связь; *v* связывать
lintel *n* перемычка *(окна или дверей)*
lip *n* выступ
liquid *n* жидкость; *a* жидкий
liquid glass жидкое стекло
list *n* список; *v* вносить в список
listen *v* слушать
load *n* груз, нагрузка; *v* грузить
lobby *n* вестибюль, приемная, коридор
local *a* местный
locate *v* располагать в определенном месте; определять местонахождение
location *n* размещение
lock *n* замок; *v* запирать
look *v* смотреть, выглядеть; **look for** искать
loose *a* свободный, широкий; **loose masonry** сухая кладка *(без раствора)*
lorry *n* грузовик
lose (lost, lost) *v* терять
loss *n* потеря, убыток
lounge *n* салон; вестибюль
love *n* любовь; *v* любить
low *a* 1) низкий; 2) слабый
low-compression *a* низкая степень сжатия
lower *v* снижать

M

machinery *n* машинное оборудование
main *a* главный, основной; **water-main** *n* водопроводная магистраль
mainly *adv* главным образом
maintain *v* поддерживать, сохранять; **to maintain peace** сохранять (отстаивать) мир
maintenance *n* уход, ремонт
major *a* основной
majority *n* большинство
make (made, made) *v* 1) делать, производить; 2) заставлять
malleability *n* ковкость, деформация в холодном состоянии
malleable *a* ковкий; **malleable cast iron** ковкий чугун
manage *v* руководить, управлять
management *n* управление
manager *n* заведующий, директор
mansion *n* особняк
mantel *n* кожух, обшивка
manufacture *n* производство; *v* производить
map *n* карта; *v* наносить на карту
marble *n* мрамор
margin *n* край
mark *n* отметка; *v* отмечать, обозначать
market *n* рынок
master *v* овладеть, изучить; *a* главный
master plan генеральный план
match *v* соответствовать, подходить
matter *n* 1) дело, вопрос; 2) вещество; **as a matter of fact** в действительности
mature *a* выдержанный *(о бетоне и т. д.)*
mean (meant, meant) *v* 1) значить, означать; 2) иметь в виду; *a* средний
meaning *n* значение, смысл
means *n* средство, способ; **means of communication** средство связи (сообщения); **means of production** средства производства; **by all means** во что бы то ни стало; **by no means** никоим образом; **by means of** при помощи, посредством
meanwhile *adv* тем временем
measurable *a* измеримый
measure *n* мера; *v* измерять
measurement *n* измерение, размеры
medium *n* среда, средство
meet (met, met) *v* 1) встречать; 2) удовлетворять
melt *v* 1) таять; 2) плавиться
member *n* 1) член; 2) элемент конструкции
mention *v* упоминать; *n* упоминание
mesh *n* сетка, арматурная сетка
metering *n* измерение, дозировка
method *n* 1) метод, способ; 2) система
mica *n* слюда
middle *n* середина
midway *adv* на полпути
mile *n* миля
military *a* военный
mill *n* 1) мельница, дробилка; 2) фабрика; 3) металлургический завод
mind *n* 1) разум; 2) мнение; *v* помнить; **to bear in mind** помнить; **to change one's mind** передумать, изменить свое решение

mine *n* шахта
mistake *n* ошибка; **a bad mistake** грубая ошибка
mix *v* мешать, смешивать
mixer *n* смеситель; **concrete mixer** *n* бетоносмеситель
mixture *n* смесь, смешивание
mobile *a* подвижный
moderate *a* умеренный, средний
modify *v* изменять
moist *a* сырой, влажный
moisture *n* влага, влажность
more *adv* более, больше; **more or less** более или менее; **much more** гораздо больше
mortar *n* раствор
motion *n* движение
mouth *n* 1) рот; 2) вход; 3) отверстие
move *v* 1) двигаться; 2) приводить в движение
mullion *n* средник
multiply *v* умножать, увеличивать

N

narrow *a* узкий; *v* суживать(ся)
nature *n* 1) природа; 2) характер; 3) сорт
necessary *n* необходимый, нужный
necessity *n* необходимость
need *n* необходимость, потребность; *v* нуждаться
negative *a* отрицательный
neglect *v* пренебрегать
neighbourhood *n* окрестность, район
neither *a* никакой; **neither ... nor** ни ... ни
network *n* сетка
nevertheless *cj* тем не менее, несмотря на
news *n* новость, новости; известие, сообщение; **latest news** последние известия; **news media** средства информации
next *a* следующий; **next to** почти
nice *a* хороший, приятный
night *n* ночь; **night after night** каждый вечер
nipple *n* ниппель, соединительная втулка
noisy *n* шумный
non-conductor *n* непроводник
non-ferrous *a* цветной *(металл)*
non-homogeneous *a* неоднородный
northern *a* северный
northward *adv* к северу; на север
note *n* заметка, запись; *v* отмечать
notice *n* объявление; *v* наблюдать, замечать
nowadays *adv* в наше время, теперь
nowhere *adv* 1) нигде; 2) никуда
number *n* число, количество; *v* насчитывать, нумеровать
numerous *a* многочисленный
nut *n* гайка, муфта *(с резьбой)*

O

object *n* 1) вещь; 2) объект; *v* возражать
obligation *n* обязательство
observation *n* наблюдение
observe *v* наблюдать, замечать
obstacle *n* препятствие
obstruction *n* преграда, препятствие
obtain *v* 1) получать; 2) достигать
obvious *a* очевидный
occasion *n* случай, возможность
occasionally *adv* изредка, случайно
occupancy *n* заселение; эксплуатация *(зданий)*
occupation *n* занятие, оккупация
occupy *v* занимать, оккупировать
occur *v* случаться, происходить
offer *n* предложение; *v* предлагать
office *n* контора
offtake *n* отводной канал
oil *n* масло, нефть; *v* смазывать
omit *v* пропускать
once *adv* 1) раз; 2) однажды; **at once** немедленно; **once more** еще раз
only *adv* только; *a* единственный
opening *n* отверстие
operate *v* 1) работать, действовать; 2) эксплуатировать *(машину)*
operation *n* работа, процесс
opinion *n* мнение
opportunity *n* благоприятная возможность
oppose *v* противопоставлять
opposite *a* противоположный
order *n* порядок; последовательность; *v* заказывать; **in order to** для того, чтобы
ordinary *a* обычный
ore *n* руда
orifice *n* отверстие, устье
origin *n* 1) источник; 2) происхождение
original *a* первоначальный
O-ring кольцевая прокладка
oscillation *n* колебание, вибрирование
other *a* другой
otherwise *adv* 1) иначе; 2) в противном случае
ounce *n* унция
outcome *n* исход
outline *n* контур, очертание
outer *a* внешний
output *n* 1) мощность; 2) выпуск
outset *n* начало
outside *adv* снаружи; *a* наружный

outskirts *n* предместье; окраина
outstanding *a* выдающийся
outwork *n* пристройка
overall *a* всеобщий
overalls *n* комбинезон
overlap *v* перекрывать, совпадать
overcome *v* преодолеть
overhaul *n* 1) тщательный осмотр; 2) капитальный ремонт
own *a* собственный; *v* владеть
ownership *n* собственность, владение
oxide *n* окись
oxygen *n* кислород

P

page *n* страница
paint *n* краска; *v* 1) красить; 2) писать красками
painter *n* 1) художник; 2) маляр
painting *n* 1) живопись; 2) картина
pair *n* пара
paper *n* 1) бумага 2) статья, доклад
parallel bars брусья
part *n* часть, доля; *v* разделять, делить на части
participate *v* участвовать
participation *n* участие
particle *n* частица
particularly *adv* особенно
partition *n* перегородка, переборка
party *n* 1) партия; 2) отряд; команда; **rescue party** спасательный отряд
pass *v* проходить
passage *n* проход, переход
past *a* прошлый
pattern *n* 1) образец; 2) модель
pay (paid, paid) *v* платить; **to pay attention** уделять внимание
peaceful *a* мирный
peat *n* торф
pebble(s) *n* галька; булыжник
peculiar *a* особенный
peg *n* деревянный колышек
penetrate *v* проникать
people *n* народ, люди; *v* населять, заселять
per cent *n* процент
perfect *a* совершенный; *v* совершенствовать
perfectly *adv* совершенно, отлично
perform *v* исполнять
perhaps *adv* может быть
permanent *a* постоянный, неизменный
permeability *n* проницаемость
permeable *a* проницаемый
permission *n* разрешение
permit *v* разрешать, допускать; *n* 1) разрешение; 2) пропуск
person *n* личность, лицо
phenomenon *n* явление
physically handicapped с физическими недостатками
pier *n* свая, простенок, бык *(моста)*
pile *n* стойка, свая
pillar tap *n* кран на колонке
pipework *n* система трубопровода
piping *n* трубопровод
place *n* место; *v* помещать; **to take place** иметь место
plain *a* 1) ясный, явный; 2) простой
plane *n* 1) плоскость; 2) самолет; *a* плоский
plant *n* 1) завод; 2) установка; 3) растение; *v* сажать
play *v* играть
pleasant *a* приятный
pleasure *n* удовольствие
plenty *n* изобилие
plaster *v* штукатурить
plumber *n* водопроводчик
point *n* 1) точка; 2) пункт; *v* показывать; **to point out** указывать
policy *n* политика; **foreign policy** внешняя политика;
pollute *v* загрязнять
poor *a* 1) бедный; 2) плохой; **poor concrete** тощая бетонная смесь
poorly *adv* бедно, скудно, плохо
populate *v* населять, заселять
population *n* население; **population explosion** демографический взрыв
position *n* положение, местонахождение
positive *a* положительный, утвердительный; **the positive sign** (знак) плюс
possess *v* обладать, владеть
possibility *n* возможность, вероятность; **a degree of possibility** степень вероятности
possible *a* возможный; вероятный; **if possible** если возможно
power *n* 1) сила; мощность; 2) держава; **electric power** электроэнергия
powerful *a* сильный, мощный, могучий; **powerful machine** мощная машина
practical *a* 1) практический; 2) фактический
practically *adv* 1) практически; 2) фактически
practice *n* практика, применение, осуществление на практике; **in practice** на практике, на деле, фактически
precede *v* предшествовать
precise *a* точный, определенный
precisely *adv* 1) именно; 2) точно
precision *n* точность; четкость; **mathematical precision** математическая точность; **precision instrument** точный прибор
prefer *v* предпочитать
preliminary *a* предварительный

preparation *n* приготовление, подготовка
prepare *v* приготавливать, подготавливать
presence *n* присутствие, наличие
present *a* присутствующий, имеющийся налицо
present *v* представить
preserve *v* сохранять, сберегать; **to preserve peace** сохранять мир
pressure *n* давление
prevent *v* предотвращать, препятствовать
price *n* цена
primarily *adv* первоначально
primary *a* первоначальный; **primary source** первоисточник
principal *a* главный, основной; **principal towns** главные города
principally *adv* главным образом, преимущественно
private *a* частный, личный
probability *n* вероятность
probable *a* вероятный, возможный
proceed *v* 1) продолжать; 2) приступать (к чему-либо)
produce *v* производить, вырабатывать, выпускать; **to produce steel** производить сталь
product *n* продукт, продукция, изобилие
production *n* 1) производительность; 2) производство
profound *a* глубокий; основательный; **profound changes** основательные перемены
progress *v* прогрессировать, развиваться
prohibit *v* запрещать
project *n* 1) проект, план; 2) строительный объект; *v* 1) проектировать, планировать; 2) выпускать, выдаваться
promise *n* обещание; *v* обещать
promote *v* способствовать, содействовать; **to promote trade** содействовать развитию торговли
proof *n* доказательство
proper *a* надлежащий, должный
properly *adv* должным образом, правильно; **to speak English properly** правильно говорить по-английски
property *n* 1) свойство; 2) собственность
proportion *n* пропорция; *v* дозировать *(смесь, составные части)*
proposal *n* предложение, план
propose *v* предлагать, вносить предложение
prospect *n* перспектива
protect *v* защищать, охранять
prove *v* 1) доказывать; 2) оказываться
provide *v* 1) обеспечивать; 2) снабжать
provided *cj* при условии, что; если только
providing *cj* при условии (что)
provision *n* снабжение, обеспечение
publish *v* издавать
pure *a* чистый, беспримесный; **pure air** чистый воздух
purify *v* очищать; **to purify air** очищать воздух
purlin *n* обрешетина
purpose *n* цель, намерение
put (put, put) *v* класть, ставить; **to put forward** выдвинуть; **to put on** надевать; класть (на); **to put up** строить, возводить, воздвигать
putty *n* замазка, шпаклевка

Q

qualify *v* приобретать какую-либо квалификацию
quality *n* качество, сорт
quantity *n* количество
quarter *n* четвертая часть, четверть; **a quarter of an hour** четверть часа
question *n* вопрос; *v* спрашивать, задавать вопрос
economic (social) questions экономические (социальные) проблемы; **out of the question** вне сомнения
quiet *a* спокойный, тихий; **quiet colours** неяркие (спокойные) цвета

R

radical *a* коренной
raft *n* плита, основание; ростверк
rafter *n* стропило, балка
rail *n* рельса
railroad *n* железная дорога
railway *n* железная дорога
rain *n* дождь
raise *v* подниматься
ram *n* таран
ramp *n* скат
rapid *a* быстрый
rapids *n* речной порог
rate *n* 1) норма; 2) коэффициент, степень; **at any rate** во всяком случае; **first rate** первоклассный
ratio *n* коэффициент, соотношение
raw *a* сырой, необработанный; **raw water** сырая вода
reach *v* 1) доставлять; 2) достигать
react *v* реагировать, взаимодействовать
ready-built *a* сборный *(о доме и т. д.)*
real *a* действительный, настоящий
realize *v* 1) понимать; 2) осуществлять
really *adv* действительно
reason *n* 1) причина, повод; 2) рассудок

reasonable *a* разумный; **a reasonable solution** разумное решение
recent *a* недавний
recently *adv* недавно
recipient *n* резервуар
reclamation *n* мелиорация, осушение
recognize *v* узнавать
recommend *v* рекомендовать, советовать
reconnaissance *n* рекогносцировка
recorder *n* записывающее устройство
reduce *v* ослаблять, понижать
reduction *n* снижение
reed *n* камыш, тростник
refer *v* относиться, ссылаться
reference *n* 1) ссылка; 2) справка; **with reference to** относительно; что касается
reflect *v* отражать
refuse *v* отказывать(ся)
regard *v* считать, рассматривать
regarding *prep* относительно
region *n* край, область, район, зона
regularly *adv* регулярно
regulation *n* правило, предписание
reinforce *v* армировать
reinforcement *n* армирование, укрепление
reject *v* отвергать
relation *n* отношение
relationship *n* отношение, связь
relative *a* относительный
release *v* освобождать, сбрасывать
reliability *n* надежность, прочность
reliable *a* надежный
rely *v* полагаться
remain *v* оставаться
remark *v* замечать
remarkable *a* замечательный
remember *v* помнить
remove *v* передвигать, убирать
renew *v* обновлять
repair *n* ремонт; *v* ремонтировать
replace *v* заменять
reply *v* отвечать; *n* ответ
report *n* отчет, доклад; *v* 1) сообщать; 2) докладывать
represent *v* представлять
representative *n* представитель
require *v* требовать
research *n* исследование; *v* исследовать; **research laboratory** *n* (научно-) исследовательская лаборатория
resilience *n* эластичность
resin *n* смола
resist *v* сопротивляться
residential *a* жилой
respect *n* 1) уважение; 2) отношение
respectively *adv* соответственно
responsibility *n* ответственность
responsible *a* ответственный
rest *v* покоиться; *n* 1) опора; 2) отдых; **the rest** остаток
restore *v* восстанавливать
restrict *v* ограничивать
result *n* результат; *v* давать в результате; **as a result** в результате
return *v* возвращаться
reverse *a* обратный
review *n* обзор
revolution *n* 1) революция; 2) оборот
revolve *v* вращаться
rib *n* ребро
ridge *n* 1) водораздел; 2) конёк *(крыши)*
right *n* право; *a* правильный; *adv* 1) прямо; 2) правильно; **in the right way** надлежащим образом
rigid *a* жесткий; негибкий
rigidity *n* твердость, устойчивость
ring *n* скоба, обруч
rise (rose, risen) *v* подниматься; *n* подъем
road *n* дорога
rod *n* прут, стержень, брус; концевой калибр
roll *n* валик, барабан
roller *n* бегунок
rotate *v* вращаться
rough *a* грубый; **rough wall** неоштукатуренная стена
roughly *adv* приблизительно
round *a* круглый; *v* округлять; **round house** депо; **rowing canal** гребной канал
ruin *v* разрушать
rule *n* правило; *v* управлять; **as a rule** как правило; **rule-of-thumb guidance** практическое правило; эмпирическое правило для приближенных подсчетов
run (ran, run) *v* 1) бегать; 2) работать *(о машине)*; *n* 1) пробег; 2) работа *(машины)*

S

safe *a* надежный, безопасный
safety *n* безопасность
safety first engineering техника безопасности
same *a* тот (же) самый; одинаковый
sample *n* образец, проба
sand *n* песок
sandblast *n* струя воздуха с песком
sandpaper *n* наждачная бумага
sandwich *n* слоистая конструкция
sandy *a* песчаный; **sandy foundation** шаткая основа
sanitary *a* гигиенический
sash *n* оконный переплет
satisfy *v* удовлетворять

save *v* 1) спасать; 2) экономить
sawdust *n* древесные опилки
say (said, said) *v* говорить, сказать; **let us say** скажем, например
scaffold *n* строительные леса, подмости
scaffolding *n* возведение лесов, подмостей
scale *n* 1) масштаб; 2) шкала; **on a large scale** в большом масштабе
science *n* наука
scientific *a* научный
scientist *n* ученый
schist *n* 1) кристаллический сланец; 2) шифер
screw *n* винт; винтовой; шуруп
seasoning *n* естественное высушивание
seat *n* место; *v* вмещать
section *n* 1) разрез; 2) секция; 3) участок
sediment *n* осадок
sedimentation *n* оседание
see (saw, seen) *v* видеть, наблюдать
seem *v* казаться
seepage *n* просачивание
seismal, seismic *a* сейсмический
seldom *adv* редко
select *v* отбирать
sell (sold, sold) *v* продавать
semicircle *n* полукруг
sense *n* 1) чувство; 2) значение
separate *a* отдельный; *v* разделять, отделять
separation *n* отделение
sequence *n* последовательность
serious *a* серьезный
serve *v* 1) служить; 2) обслуживать
service *n* обслуживание; **in service** в эксплуатации; **public services** коммунальные услуги
set (set, set) *v* устанавливать; *n* 1) установка; 2) комплект; **to set up** воздвигать
settle *v* 1) разрешать (вопрос); 2) отстаиваться, оседать
settling tank *n* отстойник
several *a* несколько
severe *a* суровый, резкий
sewage *n* сток
sewer *n* канализационная труба
sewerage *n* канализация
shallow *a* мелкий
shape *n* форма; *v* придавать форму
sharp *a* 1) острый; 2) резкий; 3) крутой
sharpen *v* точить, заострять
sheath *n* обшивка, покрышка
sheet *n* лист
shell *n* оболочка
shelter *n* укрытие
shield *n* щит
shift *n* 1) сдвиг; 2) смена
shingle *n* тонкая доска, гонт
shipment *n* отправка, погрузка
shock *n* удар
shop *n* цех, мастерская
shore *n* опора, берег
short *a* короткий
shortly *adv* вскоре
shoulder *n* край, борт
shovel *n* лопата
show *v* показывать; *n* выставка, показ
shrink *v* сжиматься
side *n* сторона
side-walk *n* тротуар
sieve *n* сито
sign *n* знак; *v* подписывать
significance *n* 1) значение; 2) важность
significantly *adv* значительно
silence *n* молчание; *v* заставить замолчать
silt *n* ил, осадок
similar *a* подобный
similarity *n* сходство, подобие
simple *a* простой
simply *adv* просто
simultaneously *adv* одновременно
since *prep* с тех пор; *cj* так как
single *a* единственный, один
site *n* 1) участок; 2) местоположение
situate *v* располагать
situation *n* положение, ситуация
size *n* размер, величина
skeleton *n* остов
skill *n* мастерство
skilled *a* квалифицированный
skylight *n* световой люк
skyscraper *n* небоскреб
slag *n* шлак
slaked lime *n* гашеная известь
slate *n* шифер, сланец
sleeve *n* рукав
slight *a* незначительный
slippery *a* скользкий
slope *n* наклон
sloping *a* наклонный, покатый
slow *a* медленный; *v* замедлять
sluice *n* водопровод, шлюз
smooth *a* гладкий, ровный
so *adv* 1) так, таким образом; 2) так что; **and so on** и так далее; **so far** до сих пор; **so far as** поскольку
soak *v* пропитывать; впитывать; вымачивать
soft *a* 1) мягкий; 2) тихий
soil *n* почва
solid *a* 1) прочный; 2) твердый
solidify *v* твердеть, застывать
solution *n* 1) раствор; 2) решение
solvable *a* растворимый
solve *v* решать
some *pron* 1) некоторый; 2) несколько

soon *adv* скоро; **as soon as** как только
sound *n* звук; *a* крепкий
source *n* 1) источник; 2) начало
south *n* юг
southern *a* южный
space *n* 1) пространство; 2) место
span *v* перекрывать (об арке, крыше и т. д.)
special *a* специальный, особый
specialist *n* специалист
specific *a* особый, специальный
specimen *n* образец
speech *n* речь
speed *n* скорость, быстрота
spend (spent, spent) *v* 1) тратить, расходовать; 2) проводить (время)
spigot *n* втулка
spillway *n* водослив
spiral *a* винтовой
split-level *a* (построенный) на разных уровнях
spongy *a* пористый
spot *n* пятно
sprayer *n* пульверизатор
spraying *n* опрыскивание
spread (spread, spread) *v* распространять
spun-glass *n* стекловолокно
square *n* 1) квадрат; 2) площадь; *a* квадратный
squeeze *v* выжимать
stability *n* устойчивость
stable *a* устойчивый, прочный
stage *n* стадия, этап
staircase *n* лестница
stamp *v* штамповать; толочь; измельчать; дробить
stand (stood, stood) *v* 1) стоять; 2) выдерживать
state *n* 1) состояние; 2) государство; 3) штат
station *n* стоянка, станция
stay *v* оставаться
steady *a* устойчивый, стабильный
steel *n* сталь
steep *a* отвесный; крутой
steeple *n* пирамидальный покров
step *n* 1) шаг; 2) ступень
stiff *a* жесткий, негибкий
stockroom *n* склад, хранилище, кладовая
stone *n* камень
stop cock *n* запорный кран
storage *n* склад, хранилище
store *v* 1) хранить; 2) запасать
stove *n* печь
straight *a* прямой; *adv* прямо
strain *n* напряжение
strainer *n* фильтр
strainmeter *n* тензометр
stream *n* 1) поток; 2) течение
street *n* улица; **street traffic** уличное движение; **the man in the street** обыватель
strength *n* сила
strengthen *v* усиливать
stress *n* напряжение, усиление; *v* подчеркивать
stretch *n* протяжение
string *n* струна, шнурок
strip *n* лента
stroke *n* удар
structural *a* структурный
structure *n* 1) структура, устройство; 2) строение, сооружение
struggle *n* борьба
strut *n* подпора
study *n* исследование
stuff *n* вещество
sub-house drain *n* канализация в доме
subject *n* тема, предмет; *v* подвергать
substance *n* вещество
substantial *a* массивный, прочный, важный
substitute *v* заменять; *n* замена
suburb *n* предместье
subway *n* 1) туннель, подземный ход; 2) метро
succeed *v* преуспевать
success *n* успех
such *a* такой; **such as** как например
sudden *a* внезапный
suddenly *adv* вдруг
sufficient *a* достаточный
suggest *v* предлагать
suit *v* соответствовать, быть пригодным
suitable *a* подходящий
suite *n* анфилада (комнат)
sum *n* сумма
summary *n* итог, резюме
summer *n* лето; **in summer** летом;
superimpose *v* накладывать
superior a 1) лучший; 2) высший
superintendent *n* начальник
supervise *v* наблюдать; руководить
supervision *n* надзор
supplement *n* добавление, дополнение
supply *n* 1) снабжение; 2) запас; *v* 1) поставлять; 2) снабжать
support *n* поддержка, опора; *v* поддерживать
suppose *v* предполагать
sure *a* уверенный
surely *adv* конечно, наверно
surface *n* поверхность
surround *v* окружать
survey *n* обследование; *v* 1) осматривать; 2) производить топографическую съемку

suspension *n* подвешенное состояние
sweep *n* изгиб
switch *n* выключатель
switchboard *n* коммутаторное табло

T

table *n* 1) стол; 2) таблица
take (took, taken) *v* брать; **to take care** заботиться; **to take off** снимать; **to take part** принимать участие; **to take place** происходить
talk *v* говорить; *n* беседа
talks *n* переговоры
tap *n* кран; *v* делать отвод; **tap cock** пробный кран; **tap water** водопроводная вода, вода из крана; **tap pipe** спускная труба; сливная труба; **tapping pipe** спускная труба
tar *n* деготь
teach (taught, taught) *v* учить
technical *a* технический
technician *n* техник
technique *n* техника
telephone exchange телефонная станция
temporary *a* временный
tendency *n* стремление
tensile *a* растяжимый
tension *n* напряжение
term *n* 1) термин; 2) срок
terms *n* условия соглашения
terrain *n* почва
test *v* испытывать; *n* испытание
testimony *n* доказательство
thank *v* благодарить; **thanks to** благодаря
thick *a* 1) толстый; 2) густой, плотный
thing *n* 1) вещь; 2) предмет
think (thought, thought) *v* думать
thorough *a* 1) тщательный; 2) совершенный
though *cj* хотя
thought *n* мысль
through *prep* через, сквозь
tie *n* скоба
tight *a* 1) плотный; 2) непроницаемый
tighten *v* натягивать, затягивать, укреплять, усиливать
tile *n* черепица
timber *n* 1) лесоматериал; 2) бревно
timber-work *n* столярная работа
time *n* 1) время; 2) раз
together *adv* вместе
toe *n* основание насыпи
tool *n* инструмент
top *n* верх, верхушка
torsion *n* скручивание; **torsion load** скручивающая нагрузка
total *a* 1) целый; 2) полный
touch *v* трогать, касаться
toward(s) *prep* по направлению к
track *n* след, путь
trade *n* 1) торговля; 2) профессия
traffic *n* движение, сообщение; транспорт; **traffic artery** транспортная магистраль; **traffic signs** дорожные знаки
train *n* поезд; *v* обучать, готовить (к чему-либо)
tramway *n* трамвайная линия
transfer *n* перемещать
transform *v* превращать
transmit *v* передавать
trap *v* поглощать, улавливать, отделять
trap-door *n* люк, опускная дверь
travel *n* 1) движение; 2) путешествие; *v* двигаться, путешествовать
traverse *v* пересекать
tray *n* лоток, желоб, поддон
treat *v* 1) обрабатывать; 2) обращаться
trestle *n* эстакада
trouble *n* 1) затруднение; 2) неполадка; *v* беспокоиться
trowel *n* лопатка штукатура
truck *n* грузовик
true *a* 1) верный; 2) правильный
truss *n* балка, ферма
truth *n* правда
try *v* 1) испытывать; 2) пробовать
T-shaped Т-образный
tube *n* труба
tunnelling *n* рытье туннеля
turn *n* поворот; *v* вращаться; **in turn(s), by turns** по очереди
type *n* тип, образец; *v* писать на машинке

U

undergo (underwent, undergone) *v* подвергаться, испытывать
undergraduate *n* студент последнего курса
underground *a* подземный; *n* метро
underline *v* подчеркивать
undertake (undertook, undertaken) *v* предпринимать
undertaking *n* предприятие
unemployed *n* безработный
unemployment *n* безработица
unfortunately *adv* к сожалению
uniform *a* однородный
unify *v* унифицировать
unit *n* 1) единица; 2) агрегат
unite *v* 1) соединять; 2) объединять
universal *a* всеобщий; универсальный
unknown *a* неизвестный
unless *cj* если не
unlike *a* непохожий на ...

unlimited *a* беспредельный, безграничный
unload *v* разгружать
until *prep* до; *cj* (до тех пор) пока
unusual *a* необычный;
up *adv* вверх; наверх; **up to** вплоть до; **up to now** до сих пор
upkeep *n* ремонт, обслуживание
upper *a* верхний
upstairs *a* находящийся на верхнем этаже
up-stream *n* вверх по течению
upwards *adv* вверх, выше, больше, старше; начиная с какого-л. периода времени в прошлом
urgent *a* срочный
use *n* 1) польза; 2) употребление; *v* 1) применять; 2) пользоваться
useful *a* пригодный
useless *a* бесполезный
U-shaped подковообразный
usual *a* обычный
utilize *v* использовать

V

valuable *a* ценный
value *n* 1) значение; 2) величина
valve *n* клапан; **valve adjuster** приспособление для регулирования клапанов; **valve gate** задвижка, заслонка
vapour *n* пар, испарение
variable *a* переменный
variation *n* 1) изменение; 2) вариант
various *a* различный
vast *a* обширный
vault *n* свод
vaulting horse конь
velocity *n* скорость
vent *n* отдушник
vent shaft *n* вытяжная шахта; **vent-stack** *n* вытяжная дымовая труба
venue *n* место сбора
vessel *n* сосуд, резервуар
viaduct *n* виадук
victory *n* победа
view *n* поле зрения; **point of view** точка зрения
visible *a* видимый
vital *a* жизненный
vitreous *a* стекловидный
voice *n* голос
void *a* пустой
volume *n* объем
V-shaped V-образный

W

wait *v* ждать
walk *v* ходить; *n* ходьба; прогулка
war *n* война
warehouse *n* склад
washer *n* шайба
waste *a* отработанный; *v* терять (время)
watch *n* часы; *v* следить
water *n* вода; *v* поливать
waterfall *n* водопад
waterproof *a* водонепроницаемый
waterwork *n* водопроводная станция
way n 1) путь; 2) способ; **in this way** таким образом; **in any way** любым способом
weak *a* слабый
wear (wore, worn) *v* носить
weather *n* погода
weigh *v* 1) взвешивать; 2) весить
weight *n* 1) вес; 2) груз
weld *n* сваривать
west *n* запад
western *a* западный
wet *a* мокрый; "Wet Paint" «Осторожно, окрашено»
wheel *n* колесо
whenever *cj* всякий раз, когда
whereas *cj* тогда как
while *cj* пока; в то время как
whoever *pron* кто бы ни
whole *a* весь, целый
wicket *n* калитка
wide *a* широкий
widen *v* расширять
width *n* ширина
winch *n* лебедка, ворот
wind *n* ветер
window *n* окно; **bay window** выступ комнаты с окном; фонарь
window-frame *n* оконная рама
windy *a* ветреный
wire *n* проволока
wing *n* флигель, крыло (дома)
wish *v* желать; *n* желание
withstand (withstood, withstood) *v* противостоять
wood n дерево
work *n* работа; *v* работать
works *n* завод, фабрика
workshop *n* цех
world *n* мир
wrap *v* окутывать, обертывать, завертывать, закутывать
wrench *n* гаечный ключ
write (wrote, written) *v* писать
writer *n* писатель
wrong *a* неверный

Y

yard *n* 1) ярд; 2) двор
yet *adv* 1) еще; 2) тем не менее

Z

zero *n* нуль
zone *n* зона; *v* разделять на зоны, на пояса

ПРИЛОЖЕНИЕ

Mathematical Symbols

1/2	a half, one half
1/3	a third, one third
1/4	a (one) quarter; a (one) fourth
3/4	three quarters, three fourths
1/5	a (one) fifth
2/5	two fifths
$2^1/_2$	two and a half
$3^1/_4$	three and a (one) quarter; three and a (one) fourth
$5^3/_4$	five and three quarters; five and three fourths
0.1	nought (zero) point one
0.01	nought point nought one
4.75	four point seven five
$+$	plus
$-$	minus
$=$	sign of equality, equals, is equal to
$\times$ or $\cdot$	miltiplication sign; multiplied by; times
$\div$ or /	division, divided by
$::$	equals; as
$<$	is less than
$>$	is greater than
$\approx$ or $\doteq$	is approximately equal
$\backsim$	is similar to
$\neq$	is not equal to
$\sqrt{\ }$	the square root of
$\sqrt[3]{\ }$	the cube root of
$\sqrt[n]{\ }$	the n-th root of
$\angle$	angle
Σ	summation of
( )	round brackets, parentheses
[ ]	brackets
{ }	braces
A'	A prime
A''	A second (double) prime; A twice dashed
A'''	A triple prime
P_1	1) P sub one; 2) P first
OP'	O multiplied by P prime
P'_1	1) P sub one prime; 2) P prime sub one; 3) P first prime
P_2	1) P sub two; 2) P second
∞	infinity
C	constant
t	time
d	distance
F	Force
m	mass
a	acceleration
$U = x^2$	U is equal to (equals) the second power of x

$F = m \cdot a$	1) Force is equal to mass multiplied by acceleration; 2) F is equal to m multiplied by a
$U = \frac{1}{1 + x^2}$	U is equal to the ratio of one to one plus x square
$\frac{1}{2}bh$	a half of the product bh
$y = 1 + \cos x$	y is equal to one plus cosine x
S_{n-1}	S sub n minus one
$S_n \to A$	S sub n tends to A
$q = m'/n'$	q is equal to m prime divided by n prime
$q = n \cdot m' \cdot 1/N$	q is equal to n multiplied by m prime multiplied by one divided by N
$y = f(x)$	y is a function of x
$d^2 = (x_1 - x_2)^2 + (y_1 - y_2)^2$	d square is equal to, round brackets opened, x sub one minus x sub two, round brackets closed, square, plus, round brackets opened, y sub one minus y sub two, round brackets closed, square
$x^2 + 2 \cdot n - 3 = f(x)$	x square plus two multiplied by n minus three is a function of x
$\frac{dz}{dx}$	a) dz over dx; b) the first derivative of z with respect to x
$\frac{d^2y}{dx^2}$	second derivative of y with respect to x
$\int$	integral of
$\int_m$	1) the integral from n to m; 2) the integral between the limits n and m
$m\frac{d^2x}{dt} = f(x)$	m multiplied by second derivative of x with respect to t is a function of x
$L = \sqrt{R^2 \pm x^2}$	capital L equals the square root out of capital R square plus minus x square
$\gamma = \frac{c'c}{ac'}$	gamma is equal to the ratio of the segment c prime c to the segment ac prime
$\frac{m}{a^n} = \sqrt[n]{a^m}$	a to the m by n-th power equals the n-th root of (out of) a to the m-th power
$\int \frac{dy}{\sqrt{c^2 - y^2}}$	the integral of dy divided by the square root out of c square minus y square
$F = C_\mu HIL \sin \theta$	capital F equals capital C sub (suffix) [mü] HIL sine theta
$\frac{a+b}{a-b} = \frac{c+d}{c-d}$	a plus b over a minus b is equal to c plus d over c minus d
$V = u\sqrt{\sin^2 i - \cos^2 i} = u$	V equals u square root of sine square i minus cosine square i equals u
$\tan r = \frac{\tan i}{1}$	tangent r equals tangent i divided by 1
$\log^2 = 0.301$	the logarithm of two equals zero point three o [ou] one
δS	the boundary of S
S'	the derived set of a given set S
$C \smile D$	union of sets C and D
$C \frown D$	intersection of sets C and D
$B \subset A$	B is a subset of A

Abbreviations Used in Writing and Printing

A. C. (a. c.) — alternating current переменный ток
C — centigrade стоградусный (о температурной шкале Цельсия)
c. p. s. — cycles per second герц
db — decibel децибел
D. C. (d. c.) постоянный ток
dia. — diameter диаметр
dm. — decimetre дециметр
e. g. — for example например
etc. — and so on и т. д.
g — gram(me) грамм
h. f. (r. f.) high frequency (radio frequency) высокая частота
h. p. — 1) horse power лошадиная сила; 2) high pressure высокое давление
h. v. — high voltage высокое напряжение
i. e. — that is то есть
Ks/s — kilocycles per second килогерц
kw — kilowatt киловатт
lb — pound фунт
lit. — litre литр
l. p. — low pressure низкое давление
l. v. — low voltage низкое напряжение
m — metre метр
m — micro микро
No; Nos — number(s) номер(а)
p. psf. — pounds per square foot фунтов на квадратный фут
p. s. i. — pounds per square inch фунтов на квадратный дюйм
r. f. — radio frequency высокая частота, радиочастота
r. p. m. — revolutions per minute оборотов в минуту
r. p. s. — revolutions per second оборотов в секунду
sc. — scale шкала
sec. — second секунда
s. w. — specific weight удельный вес
t — ton тонна
V — volt вольт
v. f. — video frequency видеочастота
W — watt ватт
yd — yard ярд

Содержание

Анна Ивановна Бурлак

Учебник английского языка

для студентов архитектурных и инженерно-строительных специальностей вузов

ИБ № 3324

Редактор А. И. Миронова. Издательский редактор И. А. Краснова.
Художественный редактор В. И. Пономаренко.
Технический редактор З. А. Муслимова. Художник Ю. И. Тиков.
Корректор З. Ф. Юрескул

Изд. № А-729. Сдано в набор 28.02.82. Подп. в печать 10.06.82.
Формат 60×90¹/₁₆. Бум. тип. № 2. Гарнитура литературная. Печать высокая.
Объем 15,5 усл. печ. л. 15,5 усл. кр.-отт. 17,83. Тираж 40 000 экз.
Зак. № 1045. Цена 85 коп.

Москва, К-51, Неглинная ул., д. 29/14. Издательство «Высшая школа»

Ордена Трудового Красного Знамени
Московская типография № 7 «Искра революции»
«Союзполиграфпрома» Государственного
Комитета СССР по делам издательств,
полиграфии и книжной торговли.
Москва, 121019, пер. Аксакова, 13.