Міністерство освіти і науки України
Національний університет «Одеська політехніка»

ІНОЗЕМНА МОВА (АНГЛІЙСЬКА МОВА-1)

Методичні вказівки

«Будівництво та цивільна інженерія»

для студентів І курсу Інституту цифрових технологій, дизайну та транспорту (ІЦТДТ)

Одеса НУОП – 2025

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Методичні вказівки для студ. 1-го курсу інституту цифрових технологій, дизайну та транспорту (ІЦТДТ) з англійської мови. / Уклад.: І.Б. Андрейкова, О. В. Лебедєва, Д. С.Лисун - Одеса: НУОП, 2025. - 49 с.

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Зміст

Передмова

Метою “Методичних вказівок” для самостійної роботи студентів є формування вмінь та навичок читання за тематикою спеціальності «192 Будівництво та цивільна інженерія» (вхідний рівень володіння мовою – B1) на I курсі навчання курсу інституту цифрових технологій, дизайну та транспорту (ІЦТДТ) з англійської мови (вихідний рівень володіння мовою – B2). За рахунок тренування і виконання читання текстів і комунікативних завдань студенти зможуть досягти практичного володіння англійською мовою за фахом.

Практичне володіння іноземною мовою в рамках даного курсу припускає наявність таких умінь, які дають можливість:

- вільно читати оригінальну літературу іноземною мовою у відповідній галузі знань;
- оформляти витягнуту з іноземних джерел інформацію у вигляді перекладу або резюме;
- робити повідомлення і доповіді іноземною мовою на теми, пов'язані з науковою роботою майбутнього фахівця;
- вести бесіду за фахом.

Кожний урок складається з тексту й комплексумовних вправ, які розраховані на удосконалення навичок активізації словарного і граматичного мінімуму професійного спрямування.

Методичні вказівки” забезпечують підготовку до міжнародного усного спілкування англійською мовою для спеціальних цілей, а саме – оволодіння лексичними, граматичними і стилістичними навичками, а також умінням читати, перекладати, згортати і розгортати усну англомовну інформацію наукового функціонального стилю, що передбачено вимогами Програми вивчення іноземних мов у нефілологічному ВНЗ.

Lesson 1

Read the text:

PRINCIPLES OF ARCHITECTURE

A building is an assemblage that is firmly attached to the ground and thatprovidestotal or nearly total shelter for machines, processing equipment, performance ofhuman activities, storage of human possessions, or any combination of these.

Building design is the process of providing all information necessary for construction of a building that will meet its owner's requirements and also satisfy publichealth, welfare, and safety requirements. **Architecture** is the art and science ofbuilding design. **Building construction** is the process of assembling materials toform a building.

Building design may be legally executed only by persons deemed competent todo so by the state in which the building is to be constructed. Competency is determined on the basis of education, experience, and ability to pass a written test ofdesign skills.

Architects are persons legally permitted to practice architecture. **Engineers** are experts in specific scientific disciplines and are legally permitted to design parts ofbuildings; in some cases, complete buildings.

Building construction is generally performed by laborers and craftspeople engaged for the purpose by an individual or organization, called a **contractor**. Thecontractor signs an agreement, or contract, with the building owner under whichthe contractor agrees to construct a specific building on a specified site and theowner agrees to pay for the materials and services provided.

In the design of a building, architects should be guided by the following principles:

1. The building should be constructed to serve purposes specified by the client.
2. The design should be constructable by known techniques and with availablelabor and equipment, within an acceptable time.
3. The building should be capable of withstanding the elements and normal usagefor a period of time specified by the client.
4. Both inside and outside, the building should be visually pleasing.
5. No part of the building should pose a hazard to the safety or health of itsoccupants under normal usage, and the building should provide for safe evacuation or refuge in emergencies.
6. The building should provide the degree of shelter from the elements and ofcontrol of the interior environment—air, temperature, humidity, light, and acoustics—specified by the client and not less than the minimums required for safetyand health of the occupants.
7. The building should be constructed to minimize adverse impact on the environment.

8. Operation of the building should consume a minimum of energy while permitting the structure to serve its purposes.

9. The sum of costs of construction, operation, maintenance, repair, and anticipatedfuture alterations should be kept within the limit specified by the client.

The ultimate objective of design is to provide all the information necessary for theconstruction of a building. This objective is achieved by the production of drawings, or plans, showing what is to be constructed, specifications stating what materials and equipment are to be incorporated in the building, and a constructioncontract between the client and a contractor. Designers also should observe construction of the building while it is in process. This should be done not only to assist the client in ensuring that the building is being constructed in accordance with plans and specifications but also to obtain information that will be useful indesign of future buildings.

Exercise 1. Read and memorize using a dictionary.

Architecture, building design, construction, shelter, architect, engineer, contractor, to withstand, hazard, evacuation, refuge, drawing

Exercise 2. Answer the questions.

1. What isArchitecture?
2. What is Building design?
3. What is Building construction?
4. What do architects do?
5. What are engineers engaged in?

Exercise 3. Match the English words with their definitions.

1. contractor	a) a person who imagines how something could be made and draws plans for it
2. designer	b) the work of building or making something
3. building	c)something that you must do
4. construction	d)the act of moving people from a dangerous place to somewhere safe
5. requirement	e) a person or company that signs a contract to supply materials or workers to perform a service or a job
6. evacuation	f)a structure with walls and a roof

Exercise 4. Fill in the gap with an appropriate word.

Construction, objective, client, equipment, production.

This ____1____ is achieved by the ____2____ of drawings, or plans, showing what is to be constructed, specifications stating what materials and ____3____ are to be incorporated in the building, and a ____4____ contract between the ____5____ and a contractor.

Exercise 5. Ask questions to the given answers.

1. Question: ____?
Answer:For safe evacuation or refuge in emergencies.
2. Question: ____?
Answer: An agreement, or contract, with the building owner.
3. Question: ____?
Answer: Laborers and craftspeople.
4. Question: ____?
Answer: On the basis of education, experience, and ability to pass a written test of design skills.
5. Question: ____?
Answer: To construct a specific building on a specified site

Exercise 6. Compose a story on one of the topics below (up to 100 words).

1. The History of Architecture
2. Modern Architecture
3. The future of Architecture

Lesson 2

Read the text:

BUILDING COSTS

Construction cost of a building usually is a dominant design concern. One reasonis that if construction cost exceeds the owner's budget, the owner may cancel theproject. Another reason is that costs, such as property taxes and insurance, that occur after completion of the building often are proportional to the initial cost.Hence, owners usually try to keep that cost low. Designing a building to minimize construction cost, however, may not be in the owner's best interests. There are many other costs that the owner incurs during the anticipated life of the building that should be taken into account.

Before construction of a building starts, the owner generally has to make a sizable investment in the project. The major portion of this expenditure usually goes for purchase of the site and building design. Remaining preconstruction costsinclude those for feasibility studies, site selection and evaluation, surveys, and program definition.

The major portion of the construction cost is the sum of the payments to the general contractor and prime contractors. Remaining construction costs usually consist of interest on the construction loan, permit fees, and costs of materials, equipment, and labor not covered by the construction contracts.

The initial cost to the owner is the sum of preconstruction, construction, and occupancy costs. The latter covers costs of moving possessions into the buildingand start-up of utility services, such as water, gas, electricity, and telephone.

After the building is occupied, the owner incurs costs for operation and maintenance of the buildings. Such costs are a consequence of decisions made duringbuilding design.

Often, preconstruction costs are permitted to be high so that initial costs can be kept low. For example, operating the building may be expensive because the designmakes artificial lighting necessary when daylight could have been made availableor because extra heating and air conditioning are necessary because of inadequateinsulation of walls and roof. As another example, maintenance may be expensivebecause of the difficulty of changing electric lamps or because cleaning the buildingis time-consuming and laborious. In addition, frequent repairs may be needed because of poor choice of materials during design. Hence, operation and maintenancecosts over a specific period of time, say 10 or 20 years, should be taken into accountin optimizing the design of a building.

Life-cycle cost is the sum of initial, operating, and maintenance costs. Generally, it is life-cycle cost that should be minimized in building design rather than construction cost. This would enable the owner to receive the greatest return on theinvestment in the building.

Nevertheless, a client usually establishes a construction budget independent of life-cycle cost. This often is necessary because the client does not have adequatecapital for an optimum building and places too low a limit on construction cost. The client hopes to have sufficient capital later to pay for the higher operating andmaintenance costs or for replacement of undesirable building materials and installed equipment. Sometimes, the client establishes a low construction budget because theclient's goal is a quick profit on early sale of the building, in which case the clienthas little or no concern with future high operating and maintenance costs for thebuilding. For these reasons, construction cost frequently is a dominant concern indesign.

Exercise 1. Read and memorize using a dictionary.

budget, tax, insurance, initial cost, construction cost, investment, expenditure, purchase, site, preconstruction costs, survey, loan, fee, profit

Exercise 2. Match the left part with the right.

1.The client hopes to have sufficient capital later	a)be minimized in building design rather than construction cost.
2. Maintenance may be expensive because of the difficulty	b)the client's goal is a quick profit on early sale of the building.
3. Life-cycle cost that should	c)to pay for the higher operating and

	maintenance costs or for replacement of undesirable building materials and installed equipment.
4. The major portion of this expenditure usually goes	d)the owner incurs costs for operation and maintenance of the buildings.
5. The client establishes a low construction budget because	e)for purchase of the site and building design.
6. After the building is occupied,	f)of changing electric lamps or because cleaning the building is time-consuming and laborious.

Exercise 3. Answer the questions.

1. Why may the owner cancel the project?
2. What does the owner have todo, before construction of a building starts?
3. What is the life-cycle cost?
4. Why may maintenance be expensive?
5. Why may frequent repairs be needed?

Exercise 4. Define the terms in English.

1. budget
2. tax
3. insurance
4. investment
5. expenditure
6. site
7. loan
8. profit

Exercise 5. Ask questions to the given answers.

1. Question: ____?
Answer: Those for feasibility studies, site selection and evaluation, surveys, and program definition.
2. Question: ____?
Answer: Is the sum of the payments to the general contractor and prime contractors.
3. Question: ____?
Answer: Of interest on the construction loan, permit fees, and costs of materials, equipment, and labor not covered by the construction contracts.
4. Question: ____?
Answer: Preconstruction costs.
5. Question: ____?
Answer: When daylight could have been made available.

Exercise 6. Compose a story on one of the topics below (up to 100 words).

1. The planning of the building construction

2. Building-costs
3. Pros and Cons of using the services of an architect

Lesson 3

Read the text:

MAJOR BUILDING SYSTEMS

The simplest building system consists of only two components. One component isa floor, a flat, horizontal surface on which human activities can take place. The other component is an enclosure that extends over the floor and generally also around it to provide shelter from the weather for human activities.

The ground may serve as the floor in primitive buildings. In better buildings, however, the floor may be a structural deck laid on the ground or supported aboveground on structural members, such as the joist and walls. Use of a deck and structural members adds at least two different types of components, ortwo subsystems, to the simplest building system. Also, often, the enclosure over the floor requires supports, such as the rafter and walls, and the walls, in turn, are seated on foundations in the ground. Additionally, footings are requiredat the base of the foundations to spread the load over a large area of the ground,to prevent the building from sinking. Consequently, even slight improvements in a primitive building introduce numerous additional components, or subsystems, into a building.

More advanced buildings consist of numerous subsystems, which are referred toas systems when they are major components. Major subsystems generally include structural framing and foundations, enclosure systems, plumbing,lighting, acoustics, safety systems, vertical-circulation elements, electric power andsignal systems, and heating, ventilation, and air conditioning (HVAC).

Structural System. The portion of a building that extends above the ground leveloutside it is called the **superstructure**. The portion below the outside ground levelis called the **substructure**. The parts of the substructure that distribute building loads to the ground are known as **foundations**.

Foundations may take the form of walls. When the ground under the building is excavated for a cellar, or basement, the foundation walls have the additional taskof retaining the earth along the outside of the building. The superstructurein such cases is erected atop the foundation walls.

The footing under a wall is called a **continuous spread footing**.A slender structural member, such as a column, usually is seated onan individual spread footing. When thesoil is so weak, however, that the spreadfootings for columns become very large,it often is economical to combine thefootings into a single footing under thewhole building. Such a footing is calleda **raft**, or **mat**, footing or a floatingfoundation. For very weak soils, it generally is necessary to support the foundations on **piles**. These areslender structural members that arehammered or otherwise driven through the weak soil, often until the tips seat onrock or a strong layer of soil.

The foundation system must be designed to transmit the loads from the superstructure structural system directly to the ground in such a manner that settlementof the completed building as the soil deflects will be within acceptable limits. Thesuperstructure structural system, in turn, should be designed to transmit its loadsto the foundation system in the manner anticipated in the design of the foundations.

In most buildings, the superstructure structural system consists of floor and roof decks, horizontal members that support them, and vertical members that supportthe other components.

The horizontal members are generally known as **beams**.

Roofs may have any of a wide variety of shapes. A specific shape may be selected because of appearance, need for attic space under the roof, requirementsfor height between roof and floor below, desire for minimum enclosed volume, structural economy, or requirements for drainage of rainwater and shedding of snow.

Exercise 1. Read and memorize using a dictionary.

floor, enclosure, deck, joist, wall, foundation, footing, load, sinking, framing, cellar, column, soil, piles, roof, beams

Exercise 2. Answer the questions.

1. What does the simplest building system consist of?
2. What serves as the floor in primitive buildings?
3. What are footings required for?
4. What is superstructure?
5. What is substructure?

Exercise 3. Find synonyms to these words:

1. footing
2. roof
3. wall
4. floor
5. raft

Exercise 4. Define the terms in English.

1. building system
2. structural deck
3. joist
4. continuous spread footing
5. column
6. pile
7. beam

Exercise 5. Ask questions to the given answers.

1. Question: ____?

Answer:Of numerous subsystems.

2. Question: ____?

Answer:Major subsystems do.

3. Question: ____?

Answer:When the ground under the building is excavated for a cellar.

4. Question: ____?

Answer: When the soil is so weak that the spread footings for columns become very large.

5. Question: ____?

Answer:To transmit the loads from the superstructure structural system directly to the ground in such a manner that settlement of the completed building as the soil deflects will be within acceptable limits.

Exercise 6. Compose a story on one of the topics below (up to 100 words).

1. The system of a primitive building
2. How to build a house on piles
3. Types of roofs

Lesson 4

Read the text:

BUILDING CODES

Many of the restrictions encountered in building design are imposed by legal regulations. While all must be met, those in building codes are the most significant because they affect almost every part of a building.

Building codes are established under the police powers of a state to protect the health, welfare, and safety of communities. A code is administered by a buildingofficial of the municipality or state that adopts it by legislation.

In general, building-code requirements are the minimum needed for public protection. Design of a building must satisfy these requirements. Often, however, architects and engineers must design more conservatively, to meet the client's needs, produce a more efficient building system, or take into account conditions not covered fully by code provisions.

Construction drawings for a building should be submitted to the building-code administrator before construction starts. If the building meets code requirements,the administrator issues a building permit, on receipt of which the contractor maycommence building. During construction, the administrator sends inspectors periodically to inspect the work. If they discover a violation, they may issue an orderto remove it or they may halt construction, depending on the seriousness of the violation. On completion of construction, if the work conforms to code requirements, the administrator issues to the owner a certificate of occupancy.

Code Classifications of Buildings. Building codes usually classify a building in accordance with the fire zone in which it is located, the type of occupancy, and thetype of construction, which is an indication of the fire protection offered.

The fire zone in which a building is located may be determined from the community's fire-district zoning map. The building code specifies the types of construction and occupancy groups permitted or prohibited in each fire zone.

The occupancy group to which a building official assigns a building depends on the use to which the building is put. Typical classifications include one- and two-story dwellings; apartment buildings, hotels, dormitories; industrial buildings with noncombustible, combustible, or hazardous contents; schools; hospitals andnursing homes; and places of assembly, such as theaters, concert halls, auditoriums,and stadiums.

Type of construction of a building is determined, in general, by the fire ratings assigned to its components. A code usually establishes two major categories: combustible and noncombustible construction. The combustible type may be subdividedin accordance with the fire protection afforded major structural components and therate at which they will burn; for example, heavy timber construction is consideredslow-burning. The noncombustible type may be subdivided in accordance with thefire-resistive characteristics of components.

Building codes may set allowable floor areas for fire-protection purposes. The limitations depend on occupancy group and type of construction. The purpose isto delay or prevent spread of fire over large portions of the building. For the samereason, building codes also may restrict building height and number of stories. Inaddition, to permit rapid and orderly egress in emergencies, such as fire, codes limitthe occupant load, or number of persons allowed in a building or room. In accordance with permitted occupant loads, codes indicate the number of exits of adequatecapacity and fire protection that must be provided.

Exercise 1. Read and memorize using a dictionary.

restriction, significant, welfare, legislation, violation, to halt, certificate of occupancy, dwelling, dormitory, auditorium, timber, story

Exercise 2. Answer the questions.

1. What restrictions are the most significant?
2. Why are building codes established?
3. Who is a code administered by?
4. What needs to be done when a violation is discovered?
5. When is a certificate of occupancy issued?

Exercise 3. Match the left part with the right.

1. Architects and engineers must design more conservatively	a)the types of construction and occupancy groups permitted or prohibited in each fire zone.
2.Construction drawings for a building should be submitted to the building-code administrator	b)the administrator sends inspectors periodically to inspect the work.

3.During construction	c)by the fire ratings assigned to its components.
4.The building code specifies	d)before construction starts.
5.Type of construction of a building is determined, in general, by the fire ratings assigned to its components.	e)the fire protection afforded major structural components and the rate at which they will burn.
6.The combustible type may be subdivided in accordance with	f)to meet the client's needs, produce a more efficient building system, or take into account conditions not covered fully by code provisions.

Exercise 4. Fill in the gap with an appropriate word.
Persons, height, purpose, fire,load.
The ____1____ is to delay or prevent spread of ____2____ over large portions of the building. For the same reason, building codes also may restrict building ____3____ and number of stories. In addition, to permit rapid and orderly egress in emergencies, such as fire, codes limit the occupant ____4____, or number of ____5____ allowed in a building or room.

Exercise 5. Ask questions to the given answers.
1. Question: ____?
Answer: Combustible and noncombustible construction.
2. Question: ____?
Answer: For fire-protection purposes.
3. Question: ____?
Answer: Building height and number of stories.
4. Question: ____?
Answer: Many of the restrictions encountered in building design.
5. Question: ____?
Answer: To protect the health, welfare, and safety of communities.

Exercise 6. Compose a story on one of the topics below (up to 100 words).
1. Building codes in the USA.
2. Building codes in the UAE.
3. What would happen if there were no building codes?

Lesson 5

Read the text:

WIND PROTECTION

For practical design, wind and earthquakes may be treated as horizontal, or lateral,loads. Although wind and seismic loads may have vertical components, these generally are small and readily resisted by columns and bearing walls. Vertical earthquake components can be important in the design of connections as in precast concrete structures. Wind often generates significant uplift forces that require special attention to vertical restraint and lateral support for members in reverse bending.

The variation with height of the magnitude of a wind load for a multistory building differs from that of a seismic load. Nevertheless, provisions for resistingeither type of load are similar.

In areas where the probability of either a strong earthquake or a high wind is small, it is nevertheless advisable to provide in buildings considerable resistance toboth types of load. In many cases, such resistance can be incorporated with littleor no increase in costs over designs that ignore either high wind or seismic resistance.

Because wind loads are considered horizontal forces, wind pressure, for design purposes, should be assumed to be applied to the gross area of the vertical projection of that portion of the building above the average level of the adjoining ground.Although the loads are assumed to be horizontal, they may nevertheless apply eitherinward pressures or suctions to inclined and horizontal surfaces. In any case, windloads should be considered to act normal to the exposed building surfaces. Furthermore, wind should be considered to be likely to come from any direction unless it is known for a specific locality that extreme winds may come only from one direction. As a consequence of this assumption, each wall of a rectangular buildingshould be considered in design to be subject to the maximum wind load.

Winds generally strike a building in gusts. Consequently, the building is subjected to dynamic loading. Nevertheless, except for unusually tall or narrow buildings, it is common practice to treat wind as a static loading, even though wind pressures are not constant. High velocity winds can cause considerable vibrations,particularly in lighter more flexible structures. Therefore, connections that tend toloosen under heavy vibration should be avoided.

Estimation of design wind pressures is complicated by several factors. One factor is the effect of natural and man-made obstructions along the ground. Another factoris the variation of wind velocity with height above ground. Still another factorcomplicating wind-pressure calculation is the effect of building or building component shape or geometry (relationship of height or width to length) on pressures.

Buildings also may be damaged by separation of other components from each other. Therefore, it is essential that all connections between structural members andbetween other components and their supports be capable of resisting design windloads. The possibility of separation of components by uplift or suction should notbe overlooked. Such pressures can slide a roof laterally or lift it from its supports,tear roof coverings, rip off architectural projections, and suck out windows. Failureof a roof diaphragm or bracing can result in failure of the entire structure.

Another hazard is drift (sway) or collapse without overturning or sliding. Excessive drift when the wind rocks a building can cause occupant discomfort, inducefailure of structural components by fatigue, or lead to complete collapse of the structure. The main resistance to drift usually is provided by structural components,such as beams, columns, bracing, and walls that are also assigned the task of supporting gravity loads. Some means must be provided to transmit wind or seismicloads from these members to the foundations and thence to the ground. Otherwise,the building may topple like a house of cards.

Exercise 1. Read and memorize using a dictionary.

earthquake, lateral load, bearing wall, uplift forces, reverse bending, a multistory building, seismic load, resistance, damage, velocity, inward pressure, suction, gust, separation, drift

Exercise 2. Answer the questions.

1. How may wind and earthquakes be treated?
2. What is the difference between a wind and an earthquake load?
3. Is resistance towind and earthquakes needed in areas where the probability of either of them is small?
4. How does wind strike a building?
5. What can high velocity winds cause?

Exercise 3. Match the left part with the right.

1.Although the loads are assumed to be horizontal	a) of connections as in precast concrete structures.
2.The main resistance to drift usually is provided	b) they may nevertheless apply either inward pressures or suctions to inclined and horizontal surfaces.
3.Vertical earthquake components can be important in the design	c)these members to the foundations and thence to the ground.
4.Such pressures can slide a roof laterally	d)the effect of building or building component shape or geometry (relationship of height or width to length) on pressures.
5.Still another factor complicating wind-pressure calculation is	e) by structural components, such as beams, columns, bracing, and walls that are also assigned the task of supporting gravity loads.
6.Some means must be provided to transmit wind or seismic loads from	f)or lift it from its supports, tear roof coverings, rip off architectural projections, and suck out windows.

Exercise 4. Define the terms in English.

1. column

2. bearing wall
3. wind velocity
4. suction
5. gust
6. drift

Exercise 5. Ask questions to the given answers.

1. Question: ____?
   Answer: Collapse without overturning or sliding.
2. Question: ____?
   Answer: Otherwise, the building may topple like a house of cards.
3. Question: ____?
   Answer: Structural components, such as beams, columns, bracing, and walls.
4. Question: ____?
   Answer: By separation of other components from each other.
5. Question: ____?
   Answer: Significant uplift forces that require special attention to vertical restraint and lateral support for members in reverse bending.

Exercise 6. Compose a story on one of the topics below (up to 100 words).

1. The risk of a natural hazard to buildings
2. Wind hazards in the USA
3. Bracing of tall buildings from the wind

Lesson 6

Read the text:

PROTECTION AGAINST EARTHQUAKES

Buildings should be designed to withstand minor earthquakes without damage, because they may occur almost everywhere. For major earthquakes, it may not be economical to prevent all damage but collapse should be precluded.

Because an earthquake and a high wind are not likely to occur simultaneously, building codes usually do not require that buildings be designed for a combinationof large seismic and wind loads. Thus, designers may assume that the full strengthof wind bracing is also available to resist drift caused by earthquakes.

The methods of protecting against high winds may alsobe used for protecting against earthquakes. Shaking of buildings produced by temblors, however, is likely to be much severer than that caused by winds. Consequently, additional precautions must be taken to protect against earthquakes. Because such protective measures will also be useful in resisting unexpectedly highwinds, such as those from tornadoes, however, it is advisable to apply aseismicdesign principles to all buildings.

These principles require that collapse be avoided, oscillations of buildingsdamped, and damage to both structural and nonstructural components minimized. Nonstructural components are especially liable to damage from large drift. For example, walls are likely to be stiffer than structural framing and therefore subjectto greater seismic forces. The walls, as a result, may crack or collapse. Also, theymay interfere with planned actions of structural components and cause additionaldamage. Consequently, aseismic design of buildings should make allowance forlarge drift, for example, by providing gaps between adjoining buildings and betweenadjoining building components not required to be rigidly connected together andby permitting sliding of such components. Thus, partitions and windows should befree to move in their frames so that no damage will occur when an earthquake racks the frames. Heavy elements in buildings, such as water tanks, should be firmly anchored to prevent them from damaging critical structural components. Displacement of gas hot water heaters is a common cause of gas fires following earthquakes.

Earthquakes are produced by sudden release of tremendous amounts of energy within the earth by a sudden movement at a point called the **hypocentre**. (The pointon the surface of the earth directly above the hypocentre is called the **epicentre**.)The resulting shock sends out longitudinal, vertical, and transverse vibrations in all directions, both through the earth's crust and along the surface, and at differentvelocities. Consequently, the shock waves arrive at distant points at different times.

As a result, the first sign of the advent of an earthquake at a distant point is likely to be faint surface vibration of short duration as the first longitudinal wavesarrive at the point. Then, severe shocks of longer duration occur there, as other waves arrive.

Movement at any point of the earth's surface during a temblor may be recorded with seismographs and plotted as seismograms, which show the variation with timeof displacements. Seismograms of past earthquakes indicate that seismic wave forms are very complex.

Ground accelerations are also very important, because they are related to the inertial forces that act on building components during an earthquake. Accelerationsare recorded in accelerograms, which are a plot of the variation with time of components of the ground accelerations.

Exercise 1. Read and memorize using a dictionary.

to withstand, to collapse, temblor, aseismic, oscillation, to crack, to rack, transverse, longitudinal

Exercise 2. Answer the questions.

1. Where can minor earthquakes occur?
2. What is essential for major earthquakes?

3. What do temblors produce?
4. Why is it advisable to apply aseismic design principles to all buildings?
5. What causes gas fires after the earthquake?

Exercise 3. Find the synonyms to these words in the text.

1. earthquake
2. to destroy
3. to resist
4. to break
5. vibration
6. speeding-up

Exercise 4. Define the terms in English.

1. hypocentre
2. epicenter
3. shock wave
4. accelerogram
5. tornado
6. seismograph
7. seismogram

Exercise 5. Ask questions to the given answers.

1. Question: ____?
Answer: The shock waves do.
2. Question: ____?
Answer: Because they are related to the inertial forces that act on building components during an earthquake.
3. Question: ____?
Answer: Nonstructural components are.
4. Question: ____?
Answer: By providing gaps between adjoining buildings and between adjoining building components not required to be rigidly connected together and by permitting sliding of such components.
5. Question: ____?
Answer: To prevent them from damaging critical structural components.

Exercise 6. Compose a story on one of the topics below (up to 100 words).

1. The severest earthquakes in the history of mankind
2. The protection from earthquakes
3. The consequences of a major earthquake.

Lesson 7

Read the text:

PROTECTION AGAINST WATER

Whether thrust against and into a building by a flood, driven into the interior by aheavy rain, leaking from plumbing, storm surge, or seeping through the exterior enclosure, water can cause costly damage to a building. Consequently, designersshould protect buildings and their contents against water damage.

Protective measures may be divided into two classes: floodproofing and waterproofing. Floodproofing provides protection against flowing surface water, commonly caused by a river overflowing its banks. Waterproofing provides protectionagainst penetration through the exterior enclosure of buildings of groundwater, rainwater, and melting snow. Buildings adjacent to large water bodies may also requireprotection from undermining due to erosion and impact from storm driven waves.

Floodproofing

A flood occurs when a river rises above an elevation, called flood stage, and is not prevented by enclosures from causing damage beyond its banks. Buildings constructed in a flood plain, an area that can be inundated by a flood, should be protected against a flood with a mean recurrence interval of 100 years.

Major objectives of floodproofing are to protect fully building and contents from damage from a l00-year flood, reduce losses from more devastating floods, and lower flood insurance premiums. Floodproofing, however, would be unnecessary ifbuildings were not constructed in flood prone areas. Building in flood prone areasshould be avoided unless the risk to life is acceptable and construction there canbe economically and socially justified.

Some sites in flood prone areas possess some ground high enough to avoid flood damage. If such sites must be used, buildings should be clustered on the high areas.Where such areas are not available, it may be feasible to build up an earth fill, withembankments protected against erosion by water, to raise structures above floodlevels. Preferably, such structures should not have basements, because they wouldrequire costly protection against water pressure.

An alternative to elevating a building on fill is raising it on stilts (columns in an unenclosed space). In that case, utilities and other services should be protectedagainst damage from flood flows. The space at ground level between the stilts maybe used for parking automobiles, if the risk of water damage to them is acceptableor if they will be removed before flood waters reach the site.

Buildings that cannot be elevated above flood stage should be furnished with an impervious exterior. Windows should be above flood stage, and doors should sealtightly against their frames. Doors and other openings may also be protected witha flood shield, such as a wall. Openings in the wall for access to the building may be protected with a movable flood shield, which for normal conditions can be stored out of sight and then positioned in the wall opening when a flood is imminent.

To prevent water damage to essential services for buildings in flood plains, important mechanical and electrical equipment should be located above flood level.Also, auxiliary electric generators to provide some emergency power are desirable.In addition, pumps should be installed to eject water that leaks into the building. Furthermore, unless a building is to be evacuated in case of flood, an emergency water supply should be stored in a tank above flood level, and sewerage should beprovided with cutoff valves to prevent backflow.

Waterproofing

In addition to protecting buildings against floods, designers also should adopt measures that prevent groundwater, rainwater, snow, or melted snow from penetratinginto the interior through the exterior enclosure. Water may leak through cracks, expansion joints or other openings in walls and roofs, or through cracks around windows and doors. Also, water may seep through solid but porous exterior materials, such as masonry. Leakage generally may be prevented by use of weather-stripping around windows and doors, impervious waterstops in joints, or calking ofcracks and other openings.

Exercise 1. Read and memorize using a dictionary.

flood, to seep, floodproofing, waterproofing, rainwater,groundwater,erosion, flood prone areas, embankment, stilt, impervious, flood shield, pump, tank, sewerage, cutoff valves, backflow, to leak, masonry

Exercise 2. Answer the questions.

1. How does water get into a building?
2. How are protective measures classified?
3. What does floodproofing provide protection against?
4. What does waterproofingprovide protection against?
5. When does a flood occur?

Exercise 3. Match the left part with the right.

1. Designers should protect buildings and their contents	a) with a flood shield.
2. Buildings adjacent to large water bodies may also	b) to avoid flood damage.
3. Building in flood prone areas should be avoided unless	c) damage from flood flows.
4. Some sites in flood prone areas possess some ground high enough	d) against water damage.
5. Utilities and other services should be protected against	e) the risk to life is acceptable and construction there can be economically and socially justified.
6.Doors and other openings may also be protected	f)require protection from undermining due to erosion and impact from storm driven waves.

Exercise 4. Define the terms in English.

1. groundwater
2. flood plain
3. embankment
4. flood shield
5. waterproof
6. floodproof

Exercise 5. Ask questions to the given answers.

1. Question: ____?
   Answer: Due to erosion and impact from storm driven waves.
2. Question: ____?
   Answer: By use of weather-stripping around windows and doors, impervious waterstops in joints, or calking of cracks and other openings.
3. Question: ____?
   Answer: If buildings were not constructed in flood prone areas.
4. Question: ____?
   Answer: Some ground high enough to avoid flood damage.
5. Question: ____?
   Answer: Windows should.

Exercise 6. Compose a story on one of the topics below (up to 100 words).

1. The severest floods in the history of mankind
2. The protection from floods
3. The consequences of a flood.

Lesson 8

Read the text:

PROTECTION AGAINST FIRE

There are two distinct aspects of fire protection: life safety and property protection. Although providing for one aspect generally results in some protection for the other,the two goals are not mutually inclusive. A program that provides for prompt notification and evacuation of occupants meets the objectives for life safety, but provides no protection for property. Conversely, it is possible that adequate propertyprotection might not be sufficient for protection of life.

Absolute safety from fire is not attainable. It is not possible to eliminate all combustible materials or all potential ignition sources. Thus, in most cases, an adequate fire protection plan must assume that unwanted fires will occur despite the best efforts to prevent them. Means must be provided to minimize the losses caused by the fires that do occur.

The first obligation of designers is to meet legal requirements while providing the facilities required by the client. In particular, the requirements of the applicablebuilding code must be met. The building code will contain fire safety requirements,or it will specify some recognized standard by reference. Many owners will alsorequire that their own insurance carrier be consulted—to obtain the most favourableinsurance rate, if for no other reason.

Although fires in buildings can be avoided, they nevertheless occur. Some of the reasons for this are human error, arson, faulty electrical equipment, poor maintenance of heating equipment, and natural causes, such as lightning. Consequently,buildings should be designed to minimize the probability of a fire and to protect life and limit property damage if a fire occurs. The minimum steps that shouldbe taken for the purpose are as follows:

1. Limit potential fire loads, with respect to both combustibility and ability to generate smoke and toxic gases.
2. Provide means for prompt detection of fires, with warnings to occupants who may be affected and notification of the presence of fire to fire fighters.
3. Communication of instructions to occupants as to procedures to adopt for safety, such as to staying in place, proceeding to a designated refuge area, or evacuating the building.
4. Provide means for early extinguishment of any fire that may occur, primarily by automatic sprinklers but also by trained fire fighters.
5. Make available also for fire fighting an adequate water supply, appropriate chemicals, adequate-size piping, conveniently located valves on the piping, hoses, pumps, and other equipment necessary.
6. Prevent spread of fire from building to building, either through adequate separation or by enclosure of the building with incombustible materials.
7. Partition the interior of the building with fire barriers, or divisions, to confine a fire to a limited space.
8. Enclose with protective materials structural components that may be damagedby fire (fireproofing).
9. Provide refuge areas for occupants and safe evacuation routes to outdoors.
10. Provide means for removal of heat and smoke from the building as rapidly aspossible without exposing occupants to these hazards, with the air-conditioning system, if one is present, assisting the removal by venting the building and by pressurizing smokeproof towers, elevator shafts, and other exits.
11. For large buildings, install standby equipment for operation in emergencies ofelectrical systems and elevators.

The nature and potential magnitude of fire in a building are directly related to theamount and physical arrangement of combustibles present, as contents of the building or as materials used in its construction. Because of this, all codes classifybuildings by occupancy and construction, because these features are related to theamount of combustibles.

The total amount of combustibles is called the fire load of the building. Fireload is expressed in pounds per square foot (psf) of floor area, with an assumedcalorific value of 7000 to 8000 Btu/lb. (This Btu content applies to organic materials similar to wood and paper. Where other materials are present in large proportion, the weights must be adjusted accordingly.

Exercise 1. Read and memorize using a dictionary.

Attainable, combustible, ignition, insurance, arson, lightning, detection, refuge area, extinguishment, incombustible, sprinkler, fire fighter

Exercise 2. Answer the questions.

1. What are the distinct aspects of a fire protection?
2. Why is absolute safety from a fire unattainable?
3. What must an adequate fire protection plan assume?
4. What is the first obligation of designers?
5. Why does a fire in a building occur?

Exercise 3. Match the left part with the right.

1.A program that provides for prompt notification and evacuation of occupants	a) the fire load of the building.
2.The total amount of combustibles is called	b) occupancy and construction, because these features are related to the amount of combustibles.
3. All codes classify buildings by	c) meets the objectives for life safety, but provides no protection for property.
4.Where other materials are present in large proportion,	d) adequate separation or by enclosure of the building with incombustible materials.
5.Prevent spread of fire from building to building, either through	e)who may be affected and notification of the presence of fire to fire fighters.
6.Provide means for prompt detection of fires, with warnings to occupants	f) the weights must be adjusted accordingly.

Exercise 4. Fill in the gap with an appropriate word.

Smoke,removal, hazards,smokeproof, means, occupants.

Provide ____1____ for removal of heat and ____2____ from the building as rapidly as possible without exposing ____3____ to these ____4____, with the air-conditioning system, assisting the ____5____ by venting the building and by pressurizing ____6____ towers, elevator shafts, and other exits.

Exercise 5. Ask questions to the given answers.

1. Question: ____?

Answer: Such as to staying in place, proceeding to a designated refuge area, or evacuating the building.

2. Question: ____?
Answer: By automatic sprinklers but also by trained fire fighters.
3. Question: ____?
Answer: Water supply, appropriate chemicals, adequate-size piping, conveniently located valves on the piping, hoses, pumps.
4. Question: ____?
Answer: Partition the interior of the building with fire barriers, or divisions.
5. Question: ____?
Answer: Electrical systems and elevators.

Exercise 6. Compose a story on one of the topics below (up to 100 words).

1. The severest fires in the history of mankind.
2. The protection from a fire.
3. The consequences of a fire.

Lesson 9

Read the text:

PROTECTION AGAINST INTRUDERS

Prevention of illegal entry into buildings by professional criminals determined to break in is not practical. Hence, the prime objective of security measures is to makeillegal entry difficult. If this is done, it will take an intruder longer to gain entry orwill compel the intruder to make noise, thus increasing the chances of detection and apprehension. Other objectives of security measures are detection of break-in attempts and intruders, alarming intruders so that they leave the premises before they cause a loss or injury, and alerting building occupants and the police of thebreak-in attempt. Also, an objective is to safeguard valuable assets by placing themin a guarded, locked, secure enclosure with access limited only to approved personnel.

Some communities have established ordinances setting minimum requirements for security and incorporated them in the building code.Provisions of these codes cover security measures for doorsand windows and associated hardware, accessible transoms, roof openings, safes,lighting of parking lots, and intrusion-detection devices. For buildings requiringunusual security measures, owners and designers should obtain the advice of a security expert.

Basic security for a building is provided by commonly used walls and roofs with openings protected by doors with key-operated locks or windows with latches. Thedegree of protection required for a building and its occupants beyond basic securityand privacy needs depends on the costs of insurance and security measures relativeto potential losses from burglary and vandalism.

For a small building not housing small items of great value (these can be placed in a safety deposit box in a bank), devices for detecting break-in attempts are generally the most practical means for augmenting basic security. Bells, buzzers,or sirens should be installed to sound an alarm and automatic telephone or wirelessdialer should be used to alert a monitoring service to notify the police when an intruder tries to enter the locked building or a security area.

For a large building or a building requiring tight security, defense should be provided in depth. Depending on the value of assets to be protected, protection should start at the boundary of the property, with fences, gates, controlled access,guard patrols, exterior illumination, alarms, or remote surveillance by closed-circuittelevision. This defense should be backed up by similar measures at the perimeterof the building and by security locks and latches on doors and windows. Openingsother than doorways or windows should be barred or made too small for human entry and screened. Within the building, valuables should be housed in locked rooms or a thick, steel safe, with controlled access to those areas.

For most types of occupancy, control at the entrance often may be provided by a receptionist who records names of visitors and persons visited, notifies the latterand can advise the police of disturbances. When necessary, the receptionist can beaugmented by a guard at the control point or in a security center and, in very largeor high-rise buildings, by a roving guard available for emergencies. If a large security force is needed, facilities should be provided in the building for an office forthe security administrator and staff, photographic identification, and squad roomand lockers—all in or adjoining a security center.

The security center may be equipped with or connected to electronic devices that do the following:

1. Detect a break-in attempt and sound an alarm.
2. Identify the point of intrusion.
3. Turn on lights.
4. Display the intruder on closed-circuit television and record observations on videotape.
5. Notify the police.
6. Limit entry to specific spaces only to approved personnel and only at permitted times.
7. Change locks automatically.

In addition, the center may be provided with emergency reporting systems, security guard tour reporting systems, fire detection and protection systems, including supervision of automatic fire sprinklers, HVAC controls, and supervision of other lifesafety measures.

Exercise 1. Read and memorize using a dictionary.

illegal, to break in, an intruder, to compel, apprehension, premises, break-in, to safeguard, transom, latch, burglary, bell, buzzer, siren, alarm, surveillance, disturbance, emergency

Exercise 2. Answer the questions.

1. What is the prime objective of security measures?
2. What are other objectives of security measures?
3. How is basic security for a building provided?
4. What devices for detecting break-in attempts are used for a small building?
5. What devices for detecting break-in attempts are used for a large building?

Exercise 3. Match the left part with the right.

1.Provisions of these codes cover security measures for	a)at the control point or in a security center.
2.This defense should be backed up by	b)security guard tour reporting systems, fire detection and protection systems, including supervision of automatic fire sprinklers, HVAC controls, and supervision of other life safety measures.
3.For buildings requiring unusual security measures, owners and designers	c)similar measures at the perimeter of the building and by security locks and latches on doors and windows.
4.Within the building, valuables should be housed in	d)should obtain the advice of a security expert.
5. The receptionist can be augmented by a guard	e)doors and windows and associated hardware, accessible transoms, roof openings, safes, lighting of parking lots, and intrusion-detection devices.
6. The center may be provided with emergency reporting systems,	f)locked rooms or a thick, steel safe, with controlled access to those areas.

Exercise 4. Choose the correct word in brackets.

For most types of (***occupancy / occupants***), control at the (***entering / entrance***) often (***may / must***) be provided by a receptionist who records names of visitors and persons (***visiting / visited***), notifies the latter and can advise the police of disturbances.

Exercise 5. Ask questions to the given answers.

1. Question: ____?
   Answer: On videotape.
2. Question: ____?
   Answer: Sound an alarm.
3. Question: ____?
   Answer: If a large security force is needed.
4. Question: ____?
   Answer: Depending on the value of assets to be protected.
5. Question: ____?
   Answer: Bells, buzzers, or sirens should.

Exercise 6. Compose a story on one of the topics below (up to 100 words).

1. The most famous break-ins in the history of mankind.
2. The protection from intruders.
3. The most secure buildings in the world.

Lesson 10

Read the text:

CEMENTITIOUS MATERIALS

Part 1.

Cementitious materials include products that are mixed with either water or some other liquid or both to form a cementing paste that may be formed or molded into a rigid shape. When sand is added to the paste, mortar is formed. A combination of coarse and fine aggregate (sand) addedto the paste forms concrete.

There are many varieties of cements and numerous ways of classification. One of the simplest classifications is by the chemical constituent that is responsible for thesetting or hardening of the cement. On this basis, the silicate and aluminate cements,wherein the setting agents are calcium silicates and aluminates, constitute the mostimportant group of modern cements. Included in this group are the **Portland**, **aluminous**, and **natural** cements.

Limes, wherein the hardening is due to the conversion of hydroxides to carbonates, were formerly widely used as the sole cementitious material, but their slow setting and hardening are not compatible with modern requirements. Hence, theirprincipal function today is to plasticize the otherwise harsh cements and add resilience to mortars and stuccoes. Use of limes is beneficial in that their slow settingpromotes healing, the recementing of hairline cracks.

Another class of cements is composed of calcined **gypsum** and its related products. The gypsum cements are widely used in interior plaster and for fabrication ofboards and blocks; but the solubility of gypsum prevents its use in construction exposed to any but extremely dry climates.

Oxychloride cements constitute a class of specialty cements of unusual properties. Their cost prohibits their general use in competition with the cheaper cements;but for special uses, such as the production of sparkproof floors, they cannot be equaled.

Masonry cements or mortar cements are widely used because of their convenience. While they are, in general, mixtures of one of more of the above-mentionedcements with some admixtures, they deserve special consideration because of theireconomies.

Other cementitious materials, such as polymers, fly ash, and silica fume, may be used as a cement replacement in concrete. Polymers are plastics with long-chainmolecules. Concretes made with them have many qualities much superior to thoseof ordinary concrete.

Silica fume, also known as **microsilica**, is a waste product of electric-arc furnaces. The silica reacts with limes in concrete to form a cementitious material. Afume particle has a diameter only 1% of that of a cement particle.

Portland cement, the most common of the modern cements, is made by carefully blending selected raw materials to produce a finished material meeting the requirements of ASTM C150 for one of eight specific cement types. Four major compounds [lime (CaO), iron (Fe_2O_3), silica (SiO_2), and alumina (Al_2O_3)] and twominor compounds [gypsum ($CaSO_4 \cdot 2H_2O$) and magnesia (MgO)] constitute theraw materials. The calcareous (CaO) materials typically come from limestone, calcite, marl, or shale. The argillaceous (SiO_2 and Al_2O_3) materials are derived fromclay, shale, and sand. The materials used for the manufacture of any specific cementare dependent on the manufacturing plant's location and availability of raw materials. Portland cement can be made of a wide variety of industrial by-products.

Exercise 1. Read and memorize using a dictionary.

cementitious materials, mortar, aggregate, paste, plaster,concrete, constituent, lime, stucco, gypsum, sparkproof, masonry, fly ash, silica fume, limestone, calcite, marl, shale, clay,sand, argillaceous

Exercise 2. Answer the questions.

1. What do cementitious materials include?
2. How is mortar formed?
3. How is concrete formed?
4. How are cements classified?
5. What kinds of cements are the most common?

Exercise 3. Match the English words and word-groups with their definitions.

1. cement	a)a type of plaster used for covering walls and ceilings
2. mortar	b)a grey powder that is mixed with water and sand to make mortar
3. concrete	c)bricks or pieces of stone which have been stuck together with cement as part of a wall or building
4.masonry	d) thick, heavy soil that is soft when wet, and hard when dry or baked, used for making bricks and containers

5. stucco	e)a mixture of sand, water, and cement or lime that is used in building
6. clay	f)a very hard building material made by mixing together cement, sand, small stones, and water

Exercise 4. Define the terms in English.

1. paste
2. plaster
3. aggregate
4. limestone
5. shale
6. calcite
7. sand

Exercise 5. Ask questions to the given answers.

1. Question: ____?
   Answer: Due to the conversion of hydroxides to carbonates.
2. Question: ____?
   Answer: In interior plaster and for fabrication of boards and blocks.
3. Question: ____?
   Answer: Solubility of gypsum does.
4. Question: ____?
   Answer: For special uses, such as the production of sparkproof floors.
5. Question: ____?
   Answer: The argillaceous (SiO_2 and Al_2O_3) materials are.

Exercise 6. Compose a story on one of the topics below (up to 100 words).

1. Common cementitious building materials.
2. The use of polymers, fly ash, and silica fume.
3. The use of Portland cement.

Lesson 11

Read the text:

CEMENTITIOUS MATERIALS

Part 2.

Aluminous cements are prepared by fusing a mixture of aluminous and calcareous materials(usually bauxite and limestone) and grinding the resultant product to a fine powder.These cements are characterized by their rapid-hardening properties and the highstrength developed at early ages.

Since a large amount of heat is liberated with rapidly by aluminous cement during hydration, care must be taken not to use the cement in places where this heat cannot be dissipated. It is usually not desirable to place aluminous-cement concretes in lifts of over 12 in; otherwise the temperature rise may cause serious weakening of the concrete.

Aluminous cements are much more resistant to the action of sulfate waters than are Portland cements. They also appear to be much more resistant to attack by water containing aggressive carbon dioxide or weak mineral acids than the silicatecements. Their principal use is in concretes where advantage may be taken of theirvery high early strength or of their sulfate resistance, and where the extra cost ofthe cement is not an important factor.

Natural cements are formed by calcining a naturally occurring mixture of calcareous and argillaceous substances at a temperature below that at which sintering takes place. The ‘‘Specification for Natural Cement,’’ ASTM C10, requires that the temperature be no higher than necessary to drive off the carbonic acid gas. Since naturalcements are derived from naturally occurring materials and no particular effort ismade to adjust the composition, both the composition and properties vary rather widely. Some natural cements may be almost the equivalent of portland cement inproperties; others are much weaker. Natural cements are principally used in masonry mortars and as an admixture in portland-cement concretes.

Limesare made principally of calcium oxide (CaO), occurring naturally in limestone, marble, chalk, coral, and shell. For building purposes, they are used chieflyin mortars.

When **gypsum** rock ($CaSO4 \cdot 2H2O$) is heated to a relatively low temperature, about130°C, three-fourths of the water of crystallization is driven off. The resulting product is known by various names such as hemihydrate, calcined gypsum, and first-
settle stucco. Its common name, however, is plaster of Paris. It is a fine powder, usually white. While it will set under water, it does not gain strength and ultimately,on continued water exposure, will disintegrate.

Plaster of Paris, with set retarded or unretarded, is used as a molding plaster or as a gaging plaster. The molding plaster is used for preparing ornamental plaster objects. The gaging plaster is used for finishing hydrated lime to form the smoothwhite-coat finish on plaster walls. The unretarded plaster of Paris is used by manufacturers to make gypsum block, tile, and gypsumboard (wallboard, lath, backer-board, coreboard, etc.).

Oxychloride cements. Lightly calcined magnesium oxide mixed with a solution of magnesium chlorideforms a cement known as magnesium oxychloride cement, or Sorel cement. It isparticularly useful in making flooring compositions in which it is mixed with coloured aggregates. Floors made of oxychloride cement are sparkproof and are moreresilient than floors of concrete.

Oxychloride cement has very strong bonding power and, because of its higher bonding power, may be used with greater quantities of aggregate than are possiblewith Portland cement. Oxychloride cement also bonds well with wood and is usedin making partition block or tile with wood shavings or sawdust as aggregate. It ismoderately resistant to water but should not be used under continually wet conditions.

Exercise 1. Read and memorize using a dictionary.

Aluminous cements, hydration, temperature, carbon dioxide, marble, chalk, coral, shell, crystallization, hemihydrate, calcined gypsum,disintegrate, gypsum board, lath

Exercise 2. Answer the questions.

1. How are Aluminous cements prepared?
2. What are Aluminous cements characterized by?
3. Why must care be taken not to use the cement in places where this heat cannot be dissipated?
4. How are natural cements formed?
5. What are limes made of?

Exercise 3. Match the left part with the right.

1.Since natural cements are derived from naturally occurring materials	a)a cement known as magnesium oxychloride cement.
2.When gypsum rock is heated to a relatively low temperature,	b)not be used under continually wet conditions.
3.The molding plaster is used for preparing	c)in making partition block or tile with wood shavings or sawdust as aggregate.
4.Lightly calcined magnesium oxide mixed with a solution of magnesium chloride forms	d) both the composition and properties vary rather widely.
5.Oxychloride cement also bonds well with wood and is used	e)ornamental plaster objects.
6.It is moderately resistant to water but should	f)three-fourths of the water of crystallization is driven off.

Exercise 4. Fill in the gap with an appropriate word.

Finish, molding, manufacturers, gaging, unretarded.

Plaster of Paris, with set retarded or unretarded, is used as a ____1____ plaster or as a gaging plaster. The molding plaster is used for preparing ornamental plaster objects. The ____2____ plaster is used for finishing hydrated lime to form the smooth white-coat ____3____ on plaster walls.The ____4____ plaster of Paris is used by ____5____ to make gypsum block, tile, and gypsum board (wallboard, lath, backer-board, core board, etc.).

Exercise 5. Ask questions to the given answers.

1. Question: ____?

Answer: To the action of sulfate waters than are Portland cements.

2. Question: ____?

Answer: In concretes where advantage may be taken of their very high early strength or of their sulfate resistance.

3. Question: ____?

Answer: In masonry mortars and as an admixture in Portland-cement concretes.

4. Question: ____?

Answer: Of calcium oxide.

5. Question: ____?

Answer: Very strong bonding power.

Exercise 6. Compose a story on one of the topics below (up to 100 words).

1. The use of Aluminous cements.
2. The use of natural cements.
3. The use of Oxychloride cements.

Lesson 12

Read the text:

AGGREGATES, MORTARS AND CONCRETES

Aggregate is a broad encompassing boulders, cobbles, crushed stone, gravel, air-cooled blast furnace slag, native and manufactured sands, and manufactured andnatural lightweight aggregates.Used in most concrete construction, aggregates are obtained by draining riverbeds or mining and crunching formational material.Boulders and cobbles are generally not used in their as-mined size but are crushed to make various sizes of coarse aggregate and manufactured sand and mineral filler. Gravels and naturally occurring sand are produced by the action ofwater and weathering on glacial and river deposits. These materials have round, smooth surfaces and particle-size distributions that require minimal processing.

Mortars are composed of a cementitious material, fine aggregate, sand, and water.They are used for bedding unit masonry, for plasters and stuccoes, and with the addition of coarse aggregate, for concrete. Properties of mortars vary greatly, being dependent on the properties of the cementitious material used, ratio of cementitious material to sand, characteristicsand grading of the sand, and ratio of water to solids.

When polymeric materials, such as styrene-butadiene and polyvinylidene chloride, are added to a mortar, greatly increased bonding, compressive, and shear strengthsresult. To obtain high strength, the other materials, including sand, water, Type Ior III Portland cement, and a workability additive, such as pulverized ground limestone or marble dust, must be of quality equal to that of the ingredients of a standardmortar. The high strength of the mortar enables masonry to withstand appreciablebending and tensile stresses.

Portland-cement concrete is a mixture of Portland cement, water, coarse and fine aggregates, and admixtures proportioned to form a plastic mass capable of beingcast, placed, or molded into forms that will harden to a solid mass. The desirable properties of plastic concrete are that it be workable, placeable and non-segregating,and that it set in the desired time. The hardened concrete should provide the desiredservice properties:

1. Strength (compressive and flexural)
2. Durability (lack of cracks, resistance to freezing and thawing and to chemical
attacks, abrasion resistance, and air content)
3. Appearance (colour, lack of surface imperfections)

Each of these properties affects the final cost of the mix design and the cost of the in-place concrete. These properties are available from normal-weight, light-weight, and heavyweight concretes.

Polymer concretes. Plastics with long-chain molecules, called polymers, are used in several ways to enhance concrete properties: replacement of Portland cement, incorporation in amix as an admixture, and impregnating hardened concrete. Polymer concretes, such as methyl methacrylate and unsaturated polyester, in which a polymer replaces Portland cement may have more than double the strengthand modulus of elasticity of Portland-cement concrete. Creep is less and resistanceto freezing and thawing cycles is higher with the polymer concretes. After curingfor a very short time, for example, overnight at room temperature, polymer concretes are ready for use, whereas ordinary concrete may have to cure for about aweek before exposure to service loads.

Exercise 1. Read and memorize using a dictionary.

boulders, cobbles, crushed stone, gravel, slag,coarse, fine, tensile, solid, workable, placeable, non-segregating, durability, creep

Exercise 2. Answer the questions.

1. What is an aggregate?
2. What are mortars composed of?
3. What do properties of mortars dependent on?
4. What happens when polymeric materials are added to a mortar?
5. What is a Portland-cement concrete?

Exercise 3. Match the left part with the right.

1.Boulders and cobbles are generally not used in their as-mined size but are	a)the final cost of the mix design and the cost of the in-place concrete.
2.Gravels and naturally occurring sand are produced by the action of	b)crushed to make various sizes of coarse aggregate and manufactured sand and mineral filler.
3.Each of these properties affects	c)polymer concretes are ready for use.
4.After curing for a very short time,	d)are obtained by draining riverbeds or

	mining and crunching formational material.
5.To obtain high strength, the other materials, including sand, water, Type I or III portland cement, and a workability additive, such as pulverized ground limestone	e)water and weathering on glacial and river deposits.
6.Used in most concrete construction, aggregates	f)or marble dust, must be of quality equal to that of the ingredients of a standard mortar.

Exercise 4. Define the terms in English.

1. boulder
2. gravel
3. polymeric materials
4. polymers
5. plastics
6. mineral filler

Exercise 5. Ask questions to the given answers.

1. Question: ____?
   Answer: By draining riverbeds or mining.
2. Question: ____?
   Answer: The high strength of the mortar does.
3. Question: ____?
   Answer: Portland-cement concrete is.
4. Question: ____?
   Answer: Workable, placeable and non-segregating.
5. Question: ____?
   Answer: The final cost of the mix design and the cost of the in-place concrete.

Exercise 6. Compose a story on one of the topics below (up to 100 words).

1. The use of Portland-cement concrete.
2. The use of Polymer concrete.
3. The properties of concrete.

Lesson 13

Read the text:

BURNED-CLAY UNITS

Use of burned-clay structural units dates from prehistoric times. Hence durability of well-burned units has been adequately established through centuries of exposurein all types of climate.

Modern burned-clay units are made in a wide variety of sizes, shapes, colours, and textures to suit the requirements of modern architecture. They include such widely diverse units as common and face brick; hollow clay tile in numerous shapes, sizes, and designs for special purposes; ceramic tile for decorative and sanitary finishes, and architectural terra cotta for ornamentation.

Properties of burned-clay units vary with the type of clay or shale used as raw material, method of fabrication of the units, and temperature of burning. As a consequence, some units, such as salmon brick, are underburned, highly porous,and of poor strength. But others are almost glass hard, have been pressed and burnedto almost eliminate porosity, and are very strong.

Brick have been made in a wide range of sizes and shapes, from the old Greek brick, which was practically a 23-in cube of 12,650 in^3 volume, to the small Belgianbrick, about $1\frac{3}{4}$x $3\frac{3}{8}$x $4\frac{1}{2}$ in with a total volume of only 27 in^3. The presentcommon nominal sizes are 4 or 6 in thick by $2\frac{2}{3}$ or 4 in highby 8 or 12 in long.

Structural clay tiles are hollow burned-clay masonry units with parallel cells. Such units have multitude of uses: as a facing tile for interior and exterior unplasteredwalls, partitions, or columns; as load-bearing tile in masonry constructions designedto carry superimposed loads; as partition tile for interior partitions carrying no superimposed load; as fireproofing tile for protection of structural members againstfire; as furring tile for lining the inside of exterior walls; as floor tile in floor androof construction; and as header tiles, which are designed to provide recesses forheader units in brick or stone-faced walls. Units are available with the following ranges in nominal dimensions: 8 to 16 in in length, 4 in for facing tile to 12 in forload-bearing tile in height, and 2 in for facing tile to 12 in for load-bearing tile inthickness.

Ceramic tile is a burned-clay product used primarily for decorative and sanitary effects. It is composed of a clay body on which is superimposed a decorative glaze.The tiles are usually flat but vary in size from about ½ in square to more than 6 in. Their shape is also widely variable—squares, rectangles, and hexagons arethe predominating forms, to which must be added coved moldings and other decorative forms. These tiles are not dependent on the colour of the clay for their final colour, since they are usually glazed. Hence, they are available in a complete colourgradation from pure whites through pastels of varying hue to deep solid colours andjet blacks.

Properties of the base vary somewhat. In particular, absorption ranges from almost zero to about 15%. The glaze is required to be impervious to liquids and should not stain, crack, or craze.

Ceramic tiles are applied on a solid backing by means of a mortar or adhesive. They are usually applied with the thinnest possible mortar joint; consequently, accuracy of dimensions is of greatest importance.

Architectural terra cotta. The term ‘‘terra cotta’’ has been applied for centuries to decorative molded-clay objects whose properties are similar to a brick. The molded shapes are fired in a manner similar to a brick. Terra cotta is frequently glazed to produce a desired colour or finish. This introduces the problem of cracking or crazing of the glaze, particularly over large areas.Structural properties of terra cotta are similar to those of clay or a shale brick.

Exercise 1. Read and memorize using a dictionary.

burned-clay, prehistoric, brick, tile, ornamentation, salmon brick,porous, unplastered, partition, superimposed loads, load-bearing, decorative, sanitary, glaze, craze, adhesive, absorption

Exercise 2. Answer the questions.

1. What burned-clay units are known?
2. What are the properties of burned-clay units?
3. What is the size of a brick?
4. What are structural clay tiles used for?
5. What shape do ceramic tiles have?

Exercise 3. Match the left part with the right.

1.Use of burned-clay structural units dates	a)with the following ranges in nominal dimensions: 8 to 16 in in length.
2.Hence durability of well-burned units has been adequately	b)in a wide range of sizes and shapes, from the old Greek brickto the small Belgian brick.
3.Brick have been made	c)from almost zero to about 15%.
4.Units are available	d)gradation from pure whites through pastels of varying hue to deep solid colours and jet blacks.
5. They are available in a complete colour	e)from prehistoric times.
6.In particular, absorption ranges	f)established through centuries of exposure in all types of climate.

Exercise 4. Define the terms in English.

1. brick
2. terra cotta
3. tile
4. absorption
5. porosity
6. adhesive

Exercise 5. Ask questions to the given answers.

1. Question: ____?
   Answer: Since they are usually glazed.
2. Question: ____?
   Answer: To be impervious to liquids and should not stain, crack, or craze.
3. Question: ____?
   Answer: By means of a mortar or adhesive.
4. Question: ____?
   Answer: The molded shapes are.
5. Question: ____?
   Answer: Face brick, hollow clay tile, ceramic tile and architectural terra cotta.

Exercise 6. Compose a story on one of the topics below (up to 100 words).

1. The use of bricks
2. The use of ceramic tiles
3. The use of architectural terra cotta

Lesson 14

Read the text:

BUILDING STONES

Principal building stones are limestones, marbles, granites, and sandstones. Other stones such as serpentine and quartzite are used locally but to a much lesser extent. Stone, in general, makes an excellent building material, if properly selected on the basis of experience; but the cost maybe relatively high.

Properties of stones depend on what nature has provided. Therefore, the designerdoes not have the choice of properties and color available in some of the manufactured building units. The most the stone producer can do for purchasers is to avoid quarrying certain stone beds that have been proved by experience to have poor strength or poor durability.

Granite is one of the most popular and versatile natural stones in the world. Its strength, durability, ease of cleaning, versatility and natural beauty make granite a valuable investment for any construction or design project.

Granite is a plutonic magmatic rock of natural origin composed mainly of three minerals: quartz, feldspar and mica. This composition gives granite stone a granular structure and a vast range of colours and shades, making it a material of great interest both from an aesthetic and a functional point of view.

The granite rock formation process takes millions of years and involves the slow cooling of magma, followed by geological processes of erosion and uplift, leading to its exposure to the surface.

Granite stone is incredibly resistant to weathering, abrasion and impact, making it perfect for outdoor paving and cladding.It is also a popular choice for building monuments and sculptures, as it can withstand harsh weather conditions and retain its beauty over time. Another valuable feature of granite slab is its durability; when properly sealed and cared for, granite can last for many years without losing its original luster and colour. In addition to its toughness, granite rock is also resistant to heat and stains, making it an ideal material for a kitchen granite countertop and work surfaces. Its smooth, non-porous surface also makes cleaning and maintenance easier.

Granite stone is often used for interior and exterior flooring, wall cladding, kitchen granite countertops, granite counters and even to create fireplaces.

Its aesthetic characteristics and its wide range of granite colours make it perfect for combining with any style of furniture, both classic and modern. At the same time, its strength and durability make it suitable for high-traffic spaces, such as lobbies and corridors in commercial buildings.

The granite monuments, which resist bad weather and climate change, are a lasting tribute to historical figures or significant events. The versatility of granite makes it a preferred choice for architects and planners who want a high-quality natural stone, both for structural and aesthetic purposes.

The word "**marble**" derives from the Greek marmaros and literally means "shining stone".**Marble** is a metamorphic rock whose main component is calcium carbonate ($CaCO_3$). There are different types of marble that are classified according to their composition and the impurities present inside them.

Based on the composition, it is possible to draw up a first categorization of the different types of marble:

1. Crystalline limestone marbles: these are pure marbles (i.e. without fossils) and generally composed of larger crystals. You can find them both white and coloured.
2. Cryptocrystalline limestone marbles: their crystalline structure is less marked than the previous type of marble and they are generally quite colourful.
3. Clastic marbles: fragments of rocks, cemented fossils as well as siliceous or calcareous materials are visible in the texture.
4. Serpentine marbles: green colored marbles whose name derives from a particular group of minerals called the serpentine group which is mixed with limestone. Sometimes, it is possible to find them in darker shades close to blue or yellow based on which mineral of serpentine group is present in the majority within the marble.

Marble is used in interior design due to its durability and resistance to impact and abrasion.

Exercise 1. Read and memorize using a dictionary.

marble, granite, sandstone, versatile, quartz, feldspar, mica, granular, aesthetic, weathering, abrasion, paving, cladding, slab

Exercise 2. Answer the questions.

1. What are the principal building stones?
2. What do properties of stones depend on?
3. What is the most popular and natural stone and why?
4. What types of marble are there?
5. What is marble used for?

Exercise 3. Match the left part with the right.

1.Stone makes an excellent building material,	a)granite can last for many years without losing its original luster and colour.
2.The word "marble" derives	b)quarrying certain stone beds that have been proved by experience to have poor strength or poor durability.
3. When properly sealed and cared for,	c)make it suitable for high-traffic spaces.
4.This composition gives granite stone	d)from the Greek marmaros and literally means "shining stone".
5.The most the stone producer can do for purchasers is to avoid	e)a granular structure and a vast range of colours and shades.
6.At the same time, its strength and durability	f)but the cost may be relatively high.

Exercise 4. Fill in the gap with an appropriate word.

Perfect,resistant, valuable,many,harsh

Granite stone is incredibly ____1____ to weathering, abrasion and impact, making it ____2____ for outdoor paving and cladding. It is also a popular choice for building monuments and sculptures, as it can withstand ____3____ weather conditions and retain its beauty over time. Another ____4____ feature of granite slab is its durability; when properly sealed and cared for, granite can last for ____5____ years without losing its original luster and colour.

Exercise 5. Ask questions to the given answers.

1. Question: ____?
   Answer: Millions of years.
2. Question: ____?
   Answer: Calcium carbonate.
3. Question: ____?
   Answer: As it can withstand harsh weather conditions and retain its beauty over time.
4. Question: ____?
   Answer: Of three minerals: quartz, feldspar and mica.
5. Question: ____?
   Answer: To heat and stains.

Exercise 6. Compose a story on one of the topics below (up to 100 words).

1. The use of granite
2. The use of marble
3. The use of limestone

Lesson 15

Read the text:

WOOD

Wood is a building material made from trees. It is a natural polymer composed of cells in the shape of long, thin tubes with tapered ends. The cell wall consists ofcellulose crystals, which are bonded together by a complex amorphous lignin composed of carbohydrates. Most of the cells in a tree trunk are oriented vertically.

Consequently, properties of wood in the direction of cell axes, usually referred to as longitudinal, or parallel to grain, differ from those in the other (radial or circumferential) directions, or across the grain.

Because of its structure, wood has different strength properties parallel and perpendicular to the grain. Tensile, bending, and compressive strengths are greatest parallel to the grain and least across the grain, whereas shear strength is least parallel to the grain and greatest across the grain. Except in plywood, the shearingstrength of wood is usually governed by the parallel-to-grain direction.

Increasing moisture content reduces all strength properties except impact bending, in which green wood is stronger than dry wood. In practice, no differentiation is made between the strength of green and dry wood in engineering timbers, because of seasoning defects that mayoccur in timbers as they dry and because large timbers normally are put into servicewithout having been dried. This is not true of laminated timber, in which dry woodmust be employed to obtain good glued joints. For laminated timber, higher stressescan be employed than for ordinary lumber. In general, compression and bendingparallel to the grain are affected most severely by moisture, whereas modulus ofelasticity, shear, and tensile strength are affected less. In practice, tensile strengthparallel to the grain is taken equal to the bending strength of wood.

Because of its nature, wood tends to absorb moisture from the air when the relative humidity is high, and to lose it when the relative humidity is low. Moisture imbibed into the cell walls causes the wood to shrink and swell as the moisture contentchanges with the relative humidity of the surrounding air. The maximum amountof imbibed moisture the cell walls can hold is known as the fibre-saturation point,and for most species is in the vicinity of 25 to 30% of the oven-dry weight of thewood. Free water held in the cell cavities above the fibre-saturation point has no effect upon shrinkage or other properties of the wood. Changes in moisture content below the fibre-saturation point cause negligible shrinkage or swelling along thegrain, and such shrinkage and swelling are normally ignored; but across the grain,considerable shrinkage and swelling occur in both the radial and tangential direction. Tangential shrinkage (as in flat-cut material) is normally approximately 50%greater than radial shrinkage (as in edge-grain material).

Separation of grain, or checking, is the result of rapid lowering of surface moisture content combined with a difference in moisture content between inner and outer portions of the piece. As wood loses moisture to the surrounding atmosphere, the outer cells of the member lose at a more rapid rate than the inner cells. As the outer cells try to shrink, they are restrained by the inner portion of the member. The more rapid the drying, the greater will be the differential in shrinkage between outer and inner fibre, and the greater the shrinkage stresses. As a result, checks may develop into splits.

Checks are radial cracks caused by nonuniform drying of wood. A **split** is a crack that results from complete separation of the wood fibres across the thickness of a member and extends parallel to the grain. (**Shakes** are another type of defect.Usually parallel to an annular ring, they develop in standing trees, whereas checks
and splits are seasoning defects.)

Exercise 1. Read and memorize using a dictionary.

tapered, amorphous, lignin, trunk, tensile, plywood, timber, shrinkage, moisture, fibre-saturation point, differentiation, laminated, shear, fibre, imbibe, vicinity, cavity

Exercise 2. Answer the questions.

1. What is wood made from?
2. How are cellulose crystals bonded together?
3. What properties does wood have?
4. When does wood absorb moisture?
5. What do changes in moisture content below the fibre-saturation point cause?

Exercise 3. Match the left part with the right.

1.Most of the cells in a tree trunk	a)can hold is known as the fibre-saturation point
2.The maximum amount of imbibed moisture the cell walls	b)occur in both the radial and tangential direction.
3. Checks may develop	c)are oriented vertically.
4. Across the grain, considerable shrinkage and swelling	d)parallel and perpendicular to the grain.
5.Tensile, bending, and compressive strengths are greatest parallel to the grain and least across the grain,	e)into splits.

6. Wood has different strength properties	f)whereas shear strength is least parallel to the grain and greatest across the grain.

Exercise 4. Define the terms in English.

1. humidity
2. shrink
3. check
4. split
5. tensile
6. plywood

Exercise 5. Ask questions to the given answers.

1. Question: ____?
   Answer: Separation of grain, or checking is.
2. Question: ____?
   Answer: By the inner portion of the member.
3. Question: ____?
   Answer: The maximum amount of imbibed moisture the cell walls can hold is.
4. Question: ____?
   Answer: Because of its nature.
5. Question: ____?
   Answer: As the moisture content changes with the relative humidity of the surrounding air.

Exercise 6. Compose a story on one of the topics below (up to 100 words).

1. The use of wood in building
2. The fire hazards of a wooden building
3. The future of wood as a building material

Література

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2 d 3 a 4 e 5 b 6 c	2 - perfect 3 - harsh 4 - valuable 5 - many	1. How long does granite rock formation process take? 2. What is the main component of marble? 3. Why is granite a popular choice for building monuments and sculptures? 4. What is granite composed of? 5. What is granite resistant to?
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