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«Оренбургский государственный университет»

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ENGLISH FOR CIVIL ENGINEERS

Part II

Рекомендовано ученым советом федерального государственного бюджетного образовательного учреждения высшего образования "Оренбургский государственный университет" для обучающихся по образовательной программе высшего образования по направлению подготовки 08.03.01 Строительство

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Учебное пособие состоит из 5 разделов, в которых представлены аутентичные тексты строительной тематики на английском языке. Пособие направлено на развитие аналитических, переводческих и коммуникативных умений студентов в области строительства.

Учебное пособие предназначено для студентов направления подготовки 08.03.01 Строительство, профили: «Автомобильные дороги и аэродромы», «Городское строительство», «Производство строительных материалов, изделий и конструкций», «Промышленное и гражданское строительство», «Теплогазоснабжение и вентиляция», «Экспертиза и управление недвижимостью», «Автодорожные мосты и тоннели».

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Содержание

Введение

Данное учебное пособие (часть вторая) составлено в рамках ОП по дисциплине «Иностранный язык» и предназначено для обучения студентов чтению, пониманию оригинальных текстов строительной тематики на английском языке, направлено на развитие аналитических, переводческих и коммуникативных умений студентов в области инженерного дела.

Целью пособия является расширение знаний по специальности «Строительство». Текстовый материал пособия знакомит студентов с различными видами новых строительных материалов, их техническими характеристиками, этапами строительства зданий различного назначения, новейшими достижениями в градостроительстве.

Учебное пособие предназначено для студентов по направлению подготовки 08.03.01 Строительство, профили: «Автомобильные дороги и аэродромы», « Автомобильные мосты и тоннели», «Городское строительство», «Производство строительных материалов, изделий и конструкций», «Промышленное и гражданское строительство», «Теплогазоснабжение и вентиляция», «Экспертиза и управление недвижимостью» (бакалавриат).

Пособие состоит 5 разделов, каждый из которых включает аутентичные тексты на английском языке, предтекстовые и послетекстовые задания и список слов к текстам, обязательных для изучения. В пособии имеются упражнения для самоконтроля студентов и тексты для самостоятельной внеаудиторной работы студентов с последующим контролем в аудитории.

Практическая ценность пособия заключается в наличии аутентичного материала, системы разнообразных упражнений на развитие аналитических и коммуникативных умений по специальности, с использованием профессиональной терминологии как в аудитории под контролем преподавателя, так и самостоятельно.

1 Unit 1 Building Materials

1.1 Text 1 The Thatchers

1.1.1 For questions 1-7, you must choose which of the paragraphs A-H fit into the numbered gaps in the following magazine article. There is one extra paragraph which does not fit in any of the gaps.

Thatched roofs, made of dried straw or reeds, are a regular feature of houses in English villages and for many people typify an ideal of the countryside. We meet two craftsmen who are keeping their traditional skills in the family, writes James Hughes-Onslow.

(1)Thatcher, Jonathon Howell, is something of an expert at juggling new technology with old. Such is the rapidly changing face of his craft that he needs to be in touch with all new developments. In some ways, his profession has changed beyond all recognition since he learned his skills from his father, but in others it remains exactly the same.

(2)Jonathan is a tenth generation thatcher who still works with his father, Bob. Arriving at Chisbury in Wiltshire, on a brisk, clear winter's day, the visitor finds the two men perched high up on the roof of the 13th century chapel, with a commanding view of the rolling Wiltshire hills. This scene must have been re-enacted many times over the centuries, but here the signs of progress are clear.

(3)But new technology hasn't changed everything. For instance, no-one has yet managed to improve on the traditional hazel spar (twigs from the hazel tree used for constructing and repairing thatched roofs), Jonathan observes with satisfaction. If you twist them when bending them, as he demonstrates, they don't snap as most other types of wood do.

(4)The Howells used to make their own hazel spars but now they're too busy, so they buy ready-made ones. Such is the pressure of having a skill that is increasingly in

demand. According to Howell senior, there is more work for thatchers - there are around 1,000 in England today, with a turnover of 150m - than there used to be.

(5)Times may be good now for thatchers, but much needs to be done at a political level to safeguard the future for the profession. Speaking at the English Thatcher's Conference this year, Sir Jocelyn Stevens, Chairman of English Heritage, called for local authorities to research and preserve traditions in their areas. He also demanded more research into methods and materials used and into growing types of straw that have fallen out of use.

(6)The Howells for their part use combed wheat reed for their thatch; this has to go through a thresher and binder rather than a modem combine harvester, which cuts the straw too short. For traditional roof use, the straw also has to be 'stooked' (stood upright and left to mature and dry outside) and later 'ricked' (the traditional method of stacking) and combed.

(7) Traditionalists are particularly upset by the use of water reeds from other European countries, because no-one knows for sure whether foreign products, however excellent in quality they may be, will be suited to English conditions. Water reeds have been grown and used for centuries in English counties like Norfolk, but the worry is that, if foreign water reeds become more widespread, the skills of thatching with long straw and combed wheat reed may be under threat.

(8) So, far from being a scene of rural bliss, peace and tranquility, the thatching industry in some countryside areas is fraught with conflicts and disagreements. Conservationists and thatchers are frequently in opposing corners, with expert advice hard to come by and no unified standards of good practice in place. But, as Jonathan Howell says: The only really important thing is to keep the skills of thatching alive.'

A Jonathan remains philosophical on this issue. 'You can understand if some house owners and some thatchers go for water reed if it is the quickest, cheapest and most reliable material they can find. But some traditionalists get very upset if a cottage

or barn in their area has been re-roofed in imported water reed. They don't like it when a new roof is not in the traditional style of the region.'

B One of the big decisions they have to make when starting repairs is how much of the old thatch to remove. In the days of horses and carts, hair-raising economies were made to avoid having to transport the old straw, or the new, any further than was strictly avoidable.

C Some observers fear that these new techniques will spell the end for traditional English thatching but Jonathan remains an optimist. That, too, is a prerequisite for the job.

D Indeed, in the UK, thatching has suffered lately from a shortage of home-grown materials, forcing property owners to buy cheaper water reeds from abroad, to replace the more traditional home-grown long straw. Ironically, these problems are compounded by the use of artificial fertilisers by English farmers, which discourages the production of the longer stems of straw that English thatchers normally desire.

E This is partly due to well-off town people buying up country cottages as second homes and then often extending them, but also because farmers have become more conscientious about the restoration of agricultural buildings.

F However, this is the kind of painstaking work that the average farm worker of the 21st century has neither the time, the skill, nor the financial incentive to cope with. So the increasing use of imported water reeds really is not surprising, even if some experts say it is threatening the architectural style of roofs in England.

G Some thatchers use willow for this purpose, but it doesn't last as long in damp conditions and can't be used on exposed ridges. Others have tried plastic but it tends to perish in the sun and invariably involves the use of glue, which eventually melts or cracks under the elements.

H Next to Jonathan is his mobile phone, neatly secured to a twisted strand of straw. Thankfully, any callers tend to keep it short - just in case he loses his balance or drops a bundle of thatch.

1.1.2 Memorize the following words and word-groups from the texts of the unit:

Thatch (v)	Крыть соломой или тростником
dried straw or reeds	Высушенная солома или камыш
to be in touch with	Быть в курсе чего-либо
perch	Жердь, шест
enact	Вводить в действие
twig	Веточка, прут, хворостника
hazel tree	орешник
snap	(зд.) сломаться
spar	(зд.) перекладина
wheat reed	Солома от пшеницы
Thresh (v)	молотить
binder	сноповязалка
mature	Зрелый, спелый, выдержанный
bliss	блаженство
tranquility	спокойствие
fraught	чреватый
spell	Означать, влечь за собой
stem	Ствол, стебель
conscientious	Добросовестный, честный
willow	ива
damp	Сырость, влажность, испарения
exposed ridges	Незащищенный конек крыши
perish	портиться

1.1.3 Correct the statements

1. Some observers believe that these new techniques will spell the end for traditional English thatching.

2. Some thatchers use oak-tree for this purpose.

3. Thatcher tends to perish in the sun and invariably involves the use of glue, which eventually melts or cracks under the elements.

4. Conservationists and thatchers are frequently in the same corners.

5. The only really important thing is to keep the old roofs alive.

1.1.4 Put the words in order

1. don't roof not traditional they style like it when a new is in the of the region.

2. new everything changed but technology hasn't.

3. reeds upset particularly European traditionalists are by the use of water from other countries.

4. purpose thatchers willow some use for this.

5. a shortage suffered home-grown thatching has lately from of materials.

1.2 Text 2 Bituminous concrete

1.2.1 Read the following words. Mind their meaning

Bituminous concrete	Асфальтобетон
Paving	Мостовая
Tar	Смола
Dense	Плотный
Distinctive	Отличительный
bumps	ухабы
voids	пустоты

handle	ручка
tires	резина
resilience	упругость
drawbacks	недостатки
derived	полученный
fossil	ископаемое
fuels	топливо
pollutants	вредные вещества
Aggregate	Совокупный

1.2.2 Read and translate the text in written form using exercise 1.2.1

Bituminous concrete is a type of construction material used for paving roads, driveways, and parking lots. It's made from a blend of stone and other forms of aggregate materials joined together by a binding agent. This binding agent is called "bitumen" and is a by-product of petroleum refining. It has a thick, sticky texture like tar when heated, and then forms a dense solid surface once it dries. Bituminous concrete is also widely known as asphalt in many parts of the world.

Despite its name, this material is quite different than standard concrete, and contains no cement. While most cement-based surfaces are white or gray, bituminous concrete is known for its distinctive black appearance. It is often laid right over a gravel base layer to form new roads and parking lots, but may also be poured over existing concrete to repair or smooth out bumps and voids. Once the bituminous concrete has been poured onto the roadway, installers use large paving machines to smooth and compact the surface.

While asphalt paving doesn't offer the same strength as traditional concrete, it's still the most popular material for most paving applications. Bituminous concrete is strong enough to handle years of vehicle traffic, and is relatively easy to repair or

refinish. It also provides a smoother and quieter ride than cement surfaces, which helps to reduce noise pollution around highways and other busy roads. Asphalt paving is also fully recyclable, though recycled products may not be as strong as raw materials. Some manufacturers add recycled tires or glass aggregate to recycled asphalt to increase its strength and resilience.

Many of the drawbacks associated with bituminous concrete concern its impact on the environment. The bituminous binding agents in asphalt are derived from fossil fuels. Not only are fossil fuels non-renewable and in limited supply, they also contribute to pollution in a number of ways. The process of deriving the fuels releases toxic fumes into the air, which contribute to poor air quality as well as global warming.

Asphalt also gives off a distinct smell during and after the paving process. This smell comes from the bituminous binding agents, which off-gas over time to release even more harmful fumes into the air. Rain and stormwater runoff may also cause pollutants from the concrete to wash off into area streams and waterways. Some of the negative environmental effects of bituminous concrete can be reduced by alternative paving techniques, including reducing the temperature of the hot asphalt before pouring.

1.2.3 Answer the following questions

1. What is bituminous concrete used for?

2. What is the difference of this material from standard concrete?

3. What do some manufacturers add to recycled asphalt to increase its strength and resilience?

4. How does bituminous concrete deal with the environment?

5. How can some of the negative environmental effects of bituminous concrete be reduced?

1.3 Text 3 What type of soil is good for a foundation for buildings or houses?

1.3.1 Read and translate the text using the dictionary

In both cities and the countryside, selection of sites with the best soil is an important engineering decision in the building process. Whether you live in a house, condo, or apartment, your home is connected to the soil. Your schools, the building where you work, the stores you shop in—all of them are built on soil, and often with it.

Soils can make or break construction projects. Engineers and soil scientists measure soil strength to see how easily a soil changes shape or shifts, to see whether it will bear the weight of structures. Watch out for soil texture and type of clay. Building on the wrong soil, or without footings on unstable clay or sand, leads to foundations that crack, landfills that leak, dams that break, and sports fields that flood.

Building foundations need to be on stable and strong soils. Soils range in strength. Some soils are able to support a skyscraper, while other soils are not able to support the weight of a human. If the soil under a building is not stable, the foundation of the building could crack, sink, or worse–the building could fall!

The strength and stability of soil depend on its physical properties. Soil with good structure is more stable. Clay textures are often more stable than sand textures because they have better structure. However, a mix of particle sizes is best for engineering (just as it is best for growing crops). It is also important that soil is stable through wetting and drying cycles, so that expanding soil does not crack roads or foundations. Some clay minerals, from a family called smectite, are more likely to shrink and expand during wetting and drying cycles than minerals from other families, such as kaolinite.

Good soil should also have the ability to capture precipitation, so that runoff and erosion do not damage structures. Finally, good soils for infrastructure have balanced chemistry so no building material corrosion occurs. Few building sites start with ideal conditions. Good engineering designs incorporate corrective measures and management practices. For example, drainage can be added or land surfaces reshaped to direct water

away from the site. It is important to know what soil properties exist to avoid future problems.

There are some well-known examples of structural failures that resulted from a lack of soil knowledge. One of the most famous is the Leaning Tower of Pisa. The land underneath seemed stable during the dry season when building began, but the soil became unstable during the wet season and sank under the weight of the building. Even worse, it sank unevenly, resulting in a leaning tower. In addition to managing drainage, compacting and stabilizing the soil before construction may have reduced settling problems.

1.3.2 Give the examples of structural failures that resulted from a lack of soil knowledge

1.3.3 Answer the following questions

1. What is one of the important engineering decisions in the building process?
2. What leads to foundations that crack, landfills that leak, dams that break, and sports fields that flood?
3. What could happen if the soil under a building is not stable?
4. Compare clay minerals, from a family called smectite with minerals from other families, such as kaolinite.
5. How many building sites start with ideal conditions?

1.4 Text 4 Pre-Engineered Building concept

1.4.1 Read the text. Find the key sentences in all passages of the text

Pre-Engineered Building (PEB) concept is a new conception of single storey industrial building construction. This methodology is versatile not only due to its quality predesigning and prefabrication, but also due to its light weight and economical construction. The concept includes the technique of providing the best possible section

according to the optimum requirement. This concept has many advantages over the Conventional Steel Building (CSB) concept of buildings with roof truss.

Steel is a material which has high strength per unit mass. Hence it is used in construction of structures with large column-free space. Most of the Industrial Structures require this criterion. Accordingly, Industrial Warehouses is usually characterized as single storey steel structures with or without mezzanine floors. The enclosures of these structures may be brick masonry, concrete walls or GI sheet coverings. The walls are generally non-bearing but sufficiently strong to withstand lateral forces caused by wind or earthquake. A combination of standard hot-rolled sections, cold-formed sections, profiled sheets, steel rods, etc. are used for the construction of industrial steel structures. Industrial buildings can be categorized as Pre-Engineered Buildings (PEB) and Conventional Steel Buildings (CSB), according to the design concepts.

Pre-Engineered Building concept involves the steel building systems which are predesigned and prefabricated. As the name indicates, this concept involves pre-engineering of structural elements using a predetermined registry of building materials and manufacturing techniques that can be proficiently complied with a wide range of structural and aesthetic design requirements. The basis of the PEB concept lies in providing the section at a location only according to the requirement at that spot. The sections can be varying throughout the length according to the bending moment diagram. This leads to the utilization of non-prismatic rigid frames with slender elements. Tapered sections made with built-up thin plates are used to achieve this configuration. Standard hot-rolled sections, cold-formed sections, profiled roofing sheets, etc. is also used along with the tapered sections. The use of optimal least section leads to effective saving of steel and cost reduction.

Conventional steel buildings (CSB) are low rise steel structures with roofing systems of truss with roof coverings. Various types of roof trusses can be used for these structures depending upon the pitch of the truss. For large pitch, Fink type truss can be used; for medium pitch, Pratt type truss can be used and for small pitch, Howe type truss

can be used. Skylight can be provided for day lighting and for more day lighting, North light type truss can be used. The selection criterion of roof truss also includes the slope of the roof, fabrication and transportation methods, aesthetics, climatic conditions, etc. Several compound and combination type of economical roof trusses can also be selected depending upon the utility. Standard hot-rolled sections are usually used for the truss elements along with gusset plates.

PEB design is rapid and efficient compared CSB design. Basic design steps are followed while optimization of materials and software analysis is possible for PEB, increasing the quality of design. CSB design is done with fewer design aids and each project needs to develop the designs which require more time.

1.4.2 Give your reasons of Pre-Engineered Building usage in construction

1.4.3 Correct the statements

1. Pre-Engineered Building concept is an old conception of multistoried industrial building construction.

2. The Conventional Steel Building (CSB) concept has many advantages over PEB concept.

3. Wood is a material which has high strength per unit mass.

4. CSB are high rise concrete structures with roofing systems of truss.

5. A few types of roof trusses can be used for CSB depending upon the pitch of the truss.

1.5 Text 5 A composite panel

1.5.1 Memorize the following words and word-groups from the texts of the unit

solid	твердый, цельный
fibers	волокнистые материалы
sawdust	опилки

epoxy resin	эпоксидная смола
shredded	измельченный
density	плотность
plywood	фанера
veneer	шпон
rigid	жесткий
honeycomb	сотовый, ячеистый, пористый
vehicles	автомобиль, транспортные средства, транспортное средство, машина
vessel	судно
freight	груз
versatility	универсальность, многофункциональность, эксплуатационная гибкость, гибкость в применении

1.5.2 Read the following words and word-groups:

structural support, including, building, used, much, aluminum, multiple, sawdust, a fine pulp, pressure, construction applications, reduced, structural stability, uniform appearance, furnishings, aerospace industries, surround, surfboards, ensure, costruction site, manufactured.

1.5.3 Read and translate the text in written form

A composite panel is a type of building material used in place of traditional wood or steel. These panels are much more lightweight than solid wood or steel, but offer similar levels of strength and structural support. There are three basic types of composite panels, including engineered wood, aluminum, and fiberglass units. Each of these panels may consist of multiple layers of the same material or a lightweight core sandwiched between sheets of some type of protective material.

An engineered wood composite panel is typically made of pressed wood fibers or sawdust blended with epoxy resin. The wood is shredded or ground into a fine pulp, then dried. The dried fibers are mixed with the epoxy and formed into sheets under high levels of heat and pressure. Depending on the type of wood fibers that are used, these panels may be known as medium-density fiberboard (MDF), particleboard, or hardboard.

Composite wood panels are used in many different construction applications, and have greatly reduced the demand for plywood. Engineered wood panels are used to add structural stability to wall framing, or to construct floors and roofs. Because these panels generally have a smooth, uniform appearance, they can also be used to make doors and furnishings. Many cabinets and other types of furniture are made using a composite panel topped with a thin layer of wood veneer. This can be used to mimic the appearance of solid wood at just a fraction of the cost.

Aluminum composite products are often known as "sandwich panels." They consist of a lightweight core wrapped in thin sheets of aluminum. The core can be made using rigid foam or resin-coated cardboard formed into a honeycomb shape. These panels offer similar levels of strength to traditional steel construction, but the weight is greatly reduced. These panels are used in the transportation and aerospace industries to create lightweight vehicles and places that are still strong enough to carry a full load.

A composite panel may also be made from a combination of fiberglass, foam, and epoxy resin. Typically these materials are sandwiched together so that sheets of fiberglass surround a foam core. This type of composite panel is commonly used in water-based applications. Many surfboards and kayaks are made from fiberglass panels, as are boats and other marine vessels. The light weight of the panels helps ensure the vessel will stay afloat, while the panel's high level of strength allows the vessel to carry passengers or freight.

The panels used in panel construction can be either factory-manufactured to specifications and simply erected on site, or they can be re-configured at the

construction site, or directly manufactured, using the proper materials and procedures, right at the site, allowing some versatility in the erection of the structure.

1.5.4 Answer the following questions

1. How many basic types of composite panels do you know? What are they?
2. What may panels consist of ?
3. What may these panels be known as?
4. What is made using a composite panel topped with a thin layer of wood veneer?
5. Do they consist of a lightweight core wrapped in thin sheets of paper?
6. What feature of the panels helps ensure the vessel will stay afloat?
7. How can the panels used in panel construction be manufactured?
8. What are made from fiberglass panels?
9. What helps ensure the vessel will stay afloat?\

1.6 Vocabulary for the topic

1.6.1 Read the following words. Mind their meaning

requirement	требование, необходимое условие
availability	доступность
durable	прочный, долговременный
fire-resistant	огнестойкий
auxiliary	вспомогательный
artificial	искусственный
property	свойство
disadvantage	недостаток
secondary	второстепенный
porosity	пористый

insulation	изоляция
alloyed steel	легированная сталь
stainless steel	нержавеющая сталь
furnace	печь, очаг
valve	клапан, вентиль
ball-bearing	шарикоподшипник
ribbed glass	рифленое стекло
corrugated glass	гофрированное стекло
lime	известь
constituent	составная часть
derivative	производный

1.6.2 Choose the proper English word

1.свойство	a)support	b)property	c)range
2.составная часть	a)derivative	b)constituent	c)resistance
3.изоляция	a)insulation	b)compactness	c)feature
4.требование	a)result	b)means	c)requirement
5.искусственный	a)durable	b)artificial	c)secondary
6.доступность	a)porosity	b)strength	c)availability
7.недостаток	a)disadvantage	b)pier	c)furnace

1.6.3 Find the English equivalents of the following Russian words

клапан, вентиль; рифленое стекло; прочный, долговременный; доступность; свойство; вспомогательный; изоляция; известь; легированная сталь; пористый.

1.6.4 Form all possible word-combinations

A.	B.
main	material
artificial	result
effective	property
mechanical	disadvantage
physical	insulation
important	strength
durable	feature

1.6.5 Read the following words. Mind their meaning

housing	жилищное строительство
residential construction	жилищное строительство
industrial construction	промышленное строительство
level of living	жизненный уровень
technological advance	технический прогресс
present-day design	современное проектирование
prefabricated structures	сборные конструкции
reinforced concrete panels	железобетонные панели
offsite prefabrication	фабричное изготовление
modern amenities	современные удобства
dwelling	жилище, дом
heating system	система отопления
hot-water supply	горячее водоснабжение
occupancy	занятость
storage facilities	складские помещения
food processing plant	пищекомбинат

advantage	преимущество
sanitary fittings	сантехническое оборудование

1.6.5 Speak on the topics under consideration

1 Building materials (The choice of building materials. The main properties of the building materials. The classification of the building materials. The most commonly used building materials.)

2 The importance of good soil for the construction of a building.

2 Unit 2 Construction systems

2.1 Text 1 The main elements of our homes

2.1.1. Warming-up

1. What structural elements do you know?
2. What are their main functions?

2.1.2 Read the following words. Mind their meaning

mortar	известковый раствор
foundation	фундамент
slab	плита
rolled gypsum panel	листовая гипсовая панель
sheet	лист
foreman	прораб
bricklayer	каменщик
carpenter	плотник
plasterer	штукатур
plumber	водопроводчик
glass-cutter = glazier	стекольщик

joiner	столяр
load	нагрузка
blueprint	план, проект (синяя светописная копия)
framework	ферма, стропила, каркас
joist	балка, перекладина, стропило
floor	пол, настил, этаж
flooring	настил, половые доски
storey	этаж
lintel	перемычка окна или двери
stringer	продольная балка
girder	балка, брус, перекладина
sewer	сточная труба
pipe	труба
settlement	осадка(грунта)
tile	черепица, кафель
tenant	житель, арендатор

2.1.3 Choose the proper English word

1.	фундамент	a) framework	b) foundation	c) structure
2.	прораб	a) workman	b) foreman	c) engineer
3.	каменщик	a) bricklayer	b) joiner	c) painter
4.	этаж	a) height	b) frame	c) storey
5.	защищать	a) to provide	b) to protect	c) to lead
6.	поддерживать	a) to impose	b) to support	c) to lay
7.	житель	a) dwelling	b) settlement	c) tenant

2.1.4 Read and translate the text using the dictionary

The combinations of materials used to build the main elements of our homes — roof, walls and floor — are referred to as construction systems. They are many and varied, and each has advantages and disadvantages depending on climate, distance from source of supply, budget, maintenance requirements and desired style or appearance.

The environmental performance of a construction system is determined by life cycle or ‘cradle to grave’ analysis of the impact of the individual materials used in it. Preliminary decisions about construction systems are often made during the early design stages of a project whereas analysis of their environmental performance often occurs later during the detailed specification stage. Making decisions in this order can limit the range of achievable and cost effective environmental outcomes.

Similar materials can have vastly different environmental impacts depending on where and how they are sourced. The source of the materials and the way they are processed ultimately determines their environmental impact. Give careful consideration to your choice of construction system early in the project, as changing systems late in the design or construction process can be costly, particularly if it requires structural alterations. Most of Australia’s new housing stock is built to a common formula that varies only slightly, regardless of climate, geographic location and occupant lifestyle.

The majority of new housing stock is built to a common formula that varies only slightly between states and cities. The formula prevails regardless of the enormous range of Australian climates, geographic locations and occupant lifestyles. The formula has developed for a variety of reasons including availability of skills and materials ease and speed of construction, market perception or familiarity with the final product, and individual or community perceptions.

This approach rarely delivers the most appropriate or even the least expensive solutions for Australian housing needs. It contributes to the environmental and economic cost of our homes and often adds little in the way of improved comfort and lifestyle.

Emphasis is often on ‘borrowed style’ and greater size — at the expense of comfort, function and performance.

Decisions may also be guided by life cycle assessment, which is able to take into account a material’s environmental emissions and depletions from ‘cradle to grave’: source, extraction, manufacture, operating performance and end of life disposal or reuse.

There is no single best solution. Any combination of materials should be assessed in light of the above factors to arrive at the most appropriate compromise. Every application is unique and should be individually evaluated. Exceptions are the norm — particularly in innovative design solutions.

Energy used for heating and cooling accounts for about 40% of home energy use. Because the mass of materials influences thermal performance, embodied energy and many of the other factors listed above, it is a primary consideration from the earliest design stages.

2.1.5 Correct the statements

1. Construction systems are many and varied, and each has only disadvantages depending on materials they made of.

2. Preliminary decisions about construction systems and analysis of their environmental performance are often made during the early design stages of a project.

3. Similar materials can have the same environmental impacts.

4. The majority of new housing stock is built to different formulae that vary too much between states and cities.

5. This approach rarely delivers the most appropriate or even the least expensive solutions for American housing needs.

6. Only one combination of materials should be assessed in light of the above factors to arrive at the most appropriate compromise.

2.2 Text 2 Thermal performance of construction systems

2.2.1 Read and translate the text using the dictionary

An important point of differentiation between construction systems is their mass content. High and low mass materials make different thermal performance contributions depending on: the climate zone they are used in where they are used (internally or externally) availability or access to passive heating or cooling how they are designed to interact with or moderate the climate.

Mass can only contribute to thermal performance when it is exposed internally and insulated externally. When used this way as thermal mass, it can even out diurnal ranges by retaining or shedding heat. Diurnal variations greater than 6°C and access to passive heating and cooling are required for this. Where they are not accessible, low mass usually performs better.

When used externally, such as in brick veneer construction, high mass systems can have other advantages but do not contribute positively to thermal performance. Indeed, they can have a negative impact in poor designs.

High mass systems

▪ generally have higher embodied energy

▪ can offset their embodied energy by reducing heating and cooling energy use over the life span of the home

▪ are most appropriate in climates with high diurnal (day–night) temperature ranges

▪ can be a liability in tropical climates where energy is used only for cooling

▪ require more substantial footing systems and cause greater site impact and disturbance

▪ are often quarried and processed with high environmental impact

▪ require careful cost–benefit analysis on remote sites where transport needs are significant.

Lightweight systems

▪ generally have lower embodied energy

▪ can yield lower total life cycle energy use, particularly where the diurnal range is low

▪ respond rapidly to external temperature changes or heating and cooling input

▪ can provide significant benefits in temperate and hot climates by cooling rapidly at night

▪ are often preferable on remote sites with high materials transport cost

▪ often require more heating and cooling energy in high diurnal range climates (where passive heating and cooling is available) due to their inability to moderate diurnal cycles

▪ can have thermal mass added through inclusion of water-filled containers or phase change materials

▪ can have lower production impact if sustainably sourced.

2.2.2 Find the main ideas of each paragraph

2.2.3 Answer the following questions

1. What is an important point of differentiation between construction systems?

2. Are diurnal variations greater than 0°C and access to passive heating and cooling required for this?

3. When can high mass systems have other advantages?

4. Do they contribute positively to thermal performance?

5. What climates are high mass systems most appropriate in?

6. When are lightweight systems often preferable ?

2.3 Text 3 Mixed mass systems

2.3.1 Read and translate the text using the dictionary

In most situations, a well-designed combination of low and high mass construction produces the best overall economic and environmental outcomes.

In temperate climates, the best overall outcome is most simply achieved with concrete slab-on-ground and lightweight walls. In hot humid climates, low mass construction is preferable. In cool climates, high mass is desirable. In cold and hot arid climates, careful positioning of low and high mass throughout the building is required to achieve the best outcomes (see Design for climate).

High mass lower levels (earth bermed precast concrete) and low mass upper levels (insulated timber framed or AAC block) are combined to optimise use of embodied and operational energy.

Construction system elements

Footing systems

Footings are the structures that transfer the weight of the home to the foundation material, most commonly soil. Footing systems must be designed to suit varying geotechnical (soil) conditions and provide adequate tie-down for the building structure under the site's wind classification. A good system meets these requirements while minimising both site disturbance and the quantities of materials with high embodied energy such as concrete and steel.

Lightweight framed systems have the lowest site impact and embodied energy. A broad range of lightweight steel footing systems is available including screw piles, adjustable steel piers on a simple concrete pad or bored columns, and pole and space frame systems.

Concrete slab integrated footings require substantial excavation on all but level sites, increasing impact. They can reduce construction costs where the slope is low and where the climate allows earth coupling to substantially offset additional embodied

energy over the life cycle.

Waffle pod slabs are an effective structural solution where required for geotechnical reasons but should be used only on sites with moderate to reactive soils because the additional steel and concrete used wastes embodied energy on stable sites. Pods can be made from old car tyres filled with compacted fill. This maintains earth coupling whereas cardboard and expanded polystyrene (EPS) foam systems do not. EPS foam often contains highly detrimental greenhouse gases, with a higher embodied energy equivalent than carbon dioxide. This further increases the embodied energy level.

Detached strip footings combined with loadbearing brickwork to floor level can reduce excavation. However, brick dwarf walls with fill often increase the embodied energy of this system.

Engineered steel pile systems capable of supporting masonry walls are now available. They reduce excavation and site impact and make for faster construction. Cost varies with application but is generally more expensive than strip footings.

2.3.2 Give a short summary of the topic

2.4 Text 4 Floor systems

2.4.1 Read and translate the text using the dictionary

High mass floors

The most common high thermal mass floor system is concrete slab-on-ground. Earth coupled slabs are effective where deep (>3m) earth temperatures remain constantly between 16 °C and 19 °C. Where temperatures fall outside this range (e.g. Darwin or Tasmania), the underside should be insulated (see Passive solar heating; Passive cooling; Concrete slab floors; Thermal mass).

Other systems include suspended slabs or precast concrete beams with lightweight infill and concrete topping. To contribute positively to thermal performance, the underside of suspended floors, including subfloor spaces, must be insulated if externally

exposed (see Insulation).

Lightweight suspended concrete floor systems are competitive in cost with timber and steel framed floors, and can reduce site impacts where a slab floor is preferable to a lightweight floor. The slab underside must be insulated.

Compacted earth, flagstone or rock (e.g. Coober Pedy in central Australia) is used less commonly but is equally effective when properly designed and built for climate and site (see Thermal mass). Such systems have either low or no embodied energy and minimal transport impact. Generally low cost.

Low mass floors

The most common form of low mass flooring is lightweight timber or steel framing with particle board, timber, plywood or compressed fiber cement sheeting. When designed and built for deconstruction (e.g. screwed, not glued), this flooring has a high potential for reuse at the end of its life.

Lightweight steel framing has higher embodied energy than timber but is highly recyclable at the end of its life. Steel framing has greater durability in termite prone areas and often has lower transport costs than equivalent timber structures. It is subject to rust in corrosive environments; galvanizing can eliminate this but does add to embodied energy. Usually more expensive than timber.

Lightweight timber framing using sustainably sourced plantation timber is a carbon sink effectively minimizing embodied energy. Engineered timber bearers and joists allow for highly efficient use of materials but glues can have a detrimental effect on indoor air quality and human health. Timber is subject to termite attack and, while termite proofing reduces this risk, it often relies on chemical treatments that have other environmental implications. It is relatively low cost.

Engineered composite panel or structural insulated panel (SIP) systems are growing in popularity. Low mass insulation materials are bonded to lightweight steel or ply sheeting and usually achieve high levels of structural efficiency with inherently high insulation levels. Cost ranges from medium to high depending on the system.

Many of these low mass floor systems offer lower embodied energy, increased structural efficiency and reduced resource depletion when sustainably manufactured from environmentally preferred materials.

Composite mass floors

Common examples of composite mass floors are: lightweight frames topped with concrete lightweight systems with water filled inserts to provide thermal mass autoclaved aerated concrete (AAC) floor systems (see Autoclaved aerated concrete) phase change materials embedded in low mass materials to produce lightweight flooring with high thermal storage capacity (see Thermal mass; Mud brick).

2.4.2 Give a short summary of the topic

2.5 Text 5 Wall systems

2.5.1 Read and translate the text using the dictionary

High mass walls

Common high thermal mass wall systems are masonry and include brick, concrete block and precast concrete. Other popular systems include rammed earth and mud brick.

Traditional masonry systems generally have high embodied energy while rammed earth and mud brick have significantly less. Rammed earth uses varying levels of cement depending on earth type and therefore has higher embodied energy than mud brick (see Rammed earth; Mud brick).

All high mass wall systems must be externally insulated and internally exposed to improve thermal performance. Insulation levels depend on internal–external temperature differentials. The higher the temperature differential, the more insulation required (see Insulation; Thermal mass; Passive design).

Thermal lag (i.e. the retention of heat or cold) in thick walls such as rammed earth or mud brick can reduce the insulation level required in mild climates but may not eliminate it. This is a common misconception about these systems. Significant external

insulation is required in cold climates and their use should be avoided in hot, humid climates. Thermal performance modeling determines climate appropriateness and appropriate insulation levels (see Thermal mass).

Insulated concrete (tilt-up or precast) — High embodied energy, high thermal mass, high insulation values possible. Low maintenance internally and externally depending on construction method and cladding system selected. Extremely durable, and can be relocated and reused. Typical painted finishes require higher maintenance. Good acoustic performance. High cost. Reduced construction times.

Low mass walls

The most common form of low mass wall construction uses lightweight timber or steel framing as the structural support system for non-structural cladding and linings such as fibre cement, plywood and steel. Insulated lightweight walls reduce heat loss and can have minimal embodied energy, depending on the cladding material used.

Fibre cement sheet, plywood and other sheet cladding systems have low embodied energy and generally low environmental impact. They are very durable — although maintenance is required for any painted surface (see Embodied energy).

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Fiber cement sheet, plywood and other sheet cladding systems have low embodied energy and generally low environmental impact. They are very durable — although maintenance is required for any painted surface (see Embodied energy).

Autoclaved aerated concrete, or AAC, contains closed air pockets that make it lightweight and fairly energy efficient.

AAC block — Medium to low embodied energy, fair thermal mass, fair insulation, average durability (depending on finishes). Maintenance required depends on

finish but these blocks are prone to impact damage. They have low processing impacts and moderate transport requirements.

Concrete block — Block walls have lower embodied energy than concrete or brick because they are hollow and contain less concrete per square metre. However, when filled with concrete they can equal or exceed the embodied energy of brick. Fly ash blocks further reduce embodied energy. They have good thermal mass when filled with concrete, but low insulation values (which is difficult to add unless lined externally). Not easily recycled because they have insufficient strength for reuse as aggregate for concrete. Can be crushed as gravel or fill. Average cost.

Panel systems — Sandwich panels have varying embodied energy depending on surface materials and insulation. Other lightweight panel systems such as straw board and recycled paper products have low thermal mass, high insulation levels and very low embodied energy. They respond rapidly to heating and cooling and are ideally used with a high mass concrete slab floor. The recycled content of many commonly available systems is high. Reuse potential is good, waste rates are low and transport costs are low. Construction cost varies from high to average.

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Mud brick (adobe) — Lowest embodied energy (if sourced locally), high thermal mass, poor insulation (difficult to add unless lined externally), suited to remote sites. High labour content. No manufacturing impact. Low site impact. Low cost if labour is

not included (owner built). Requires regular waterproofing in exposed locations (see Mud brick).

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AAC block — Medium to low embodied energy, fair thermal mass, fair insulation, average durability (depending on finishes). Maintenance required depends on finish but these blocks are prone to impact damage. They have low processing impacts and moderate transport requirements (see Autoclaved aerated concrete).

Straw bale — Low embodied energy (some additional embodied energy and materials in extra width footings and slabs). Low–medium thermal mass (depending on render thickness). Extremely high insulation, excellent thermal performance, and high level renewable material content. Long term durability is unproven in Australia and maintenance levels are variable. Bales must be compressed well to minimise settlement and movement. Cost varies from average to high (see Straw bale).

Earth covered construction can provide sufficient thermal lag to moderate seasonal cycles.

Green roofs — An entirely different system to earth covered roofs. Growing medium is usually lightweight manufactured material. Insulation is medium to high and provided by conventional insulation rather than the covering. Medium to high embodied energy, depending on support structures. Thermal mass is generally inaccessible due to structure and insulation. Other environmental benefits include food production, reduction of heat island over built-up areas, air quality improvement and on-site stormwater detention. Medium to low maintenance for intensive roofs to high maintenance for most green wall systems (see Green roofs and walls).

Low mass roof systems

The performance of lightweight timber or steel framed roof systems is similar to walls and frames. Variations in embodied energy arise from cladding systems that do not contribute to thermal performance.

Tiles — Concrete tiles have slightly lower embodied energy than terracotta. They require more structural support than lightweight materials and can add to heat gain (because they are external, uninsulated thermal mass) unless well insulated. While recycling and reuse rates are improving, they are still lower than other materials. Some manufacturers claim up to 40 % recycled content in concrete tiles. High transport costs make them inappropriate for remote sites.

Metal sheeting — High embodied energy; very durable; ideal for transport to remote sites; available in light colours and reflective finishes to reduce heat gain in summer. Recycled content of up to 40% is common and end of life recycling or reuse rates are high.

2.5.2 Give a short summary of the topic

2.6 Text 6 Other construction system considerations

2.6.1 Read and translate the text using the dictionary

A host of other considerations must be taken into account for construction systems. Many are beyond the scope of environmental performance addressed in Your Home and require expert advice from geotechnical and structural engineers.

For other considerations with environmental performance implications see the relevant articles including:

specific site requirements such as slope, storm water, sediment control, biodiversity impact, noise control and fire resistance (see Choosing a site; Challenging sites)

regulatory and planning issues (see The livable and adaptable house; Transport; the appendices Streetscape, Safety and security;)

exposure to destructive forces of nature such as fire, termites, rain, UV and humidity (see Challenging sites).

In most situations, a carefully designed combination of lightweight and heavyweight systems produces the best overall economic and environmental outcomes.

Rule-of-thumb checklist for choosing a construction system

Thermal mass

Combine high and low mass construction within the building to maximise the benefits of each (see Thermal mass; Passive design).

Use heavyweight systems internally and lightweight systems externally for lowest lifetime energy use.

Higher embodied energy content in heavyweight construction can outweigh operational energy savings, particularly in climates where heating and cooling energy requirements are low (see Embodied energy).

Where solar access is unachievable or undesirable (e.g. steep south facing sites, overshadowed sites or tropical locations), insulated lightweight construction is often more efficient as it responds rapidly to mechanical heating or cooling.

Maintenance

Unpainted external brick cladding (brick veneer) has minimal maintenance requirements when compared to many alternative painted claddings.

The durability of well-maintained lightweight systems is equivalent to heavyweight systems.

Poor maintenance can reduce life span by up to 50%, negating embodied energy savings and doubling materials consumption.

Reliable maintenance regimes for the whole life cycle are a critical consideration when selecting external cladding systems.

Source and use of materials

Choose materials that are: life cycle certified by an accredited scheme (e.g. GECA, Green Tick, EcoSpecifier) renewable in preference to those from finite resources low in embodied energy unless that embodied energy content can be amortised over life span through operating energy savings certified as not threatening to biodiversity low toxicity in both production and operation high in renewable or recycled content provided durability and performance are appropriate for life span (e.g. fiber cement cladding,

sustainably managed forest timber frames or recycled plastic/sawdust decking).

Design for: deconstruction, recycling and reuse to amortise the life cycle impact of materials high in embodied energy or non-renewable resources (where these materials are the best option) structural efficiency to minimise overall materials use, waste, transport and processing materials with similar and appropriate life spans (e.g. use fixings, flashings or sealants with a similar life span to the material being fixed) construction systems with known low wastage rates and environmentally sound production processes (see Waste minimisation).

2.6.2 Read the following words. Mind their meaning

gap	промежуток
rough	грубый
pointed arch	стрельчатая арка
false arch	ложная арка
corbel arch	арка с навесной кладкой (кирпича)
cast-iron	чугун
span	расстояние (между опорами арки свода)
stiffness	жёсткость
tubular	трубчатый
braced	укреплённый
beam	балка; перекладина
a cantilever beam	консольная балка
an overhanging beam	нависающая балка
a continuous beam	сплошная балка
a fixed beam	балка с закреплёнными концами
girder	балка, ферма
dome	купол; свод
counterpart	копия; дубликат

dimension	размер
axis	ось
load	нагрузка
shell	свод
vaultlike	сводчатый
magnitude	величина; размеры
mass concrete	бетон без арматуры, монолитный бетон
plywood	фанера (клеёная)
latitude	широта , обширность
masonry	каменная или кирпичная кладка

2.6.3 Read the following verbs. Mind their meaning. Pay attention to the principal forms

to overcome(overcame; overcome)	охватить
to wedge (-ed;-ed)	закреплять клином
to incline (-ed;-ed)	наклонять
to invert (-ed;-ed)	переворачивать
to cut (cut; cut)	отрубать, отрезать
to support (-ed;-ed)	поддерживать
to project (-ed;-ed)	выступать, выдаваться
to become (became; become)	становиться
to restrain (-ed;-ed)	сдерживать
to transmit(-ed;-ed)	передавать
to supplant(-ed;-ed)	вытеснить (заменить)

2.6.4 Find the proper Russian words with the same roots as the following English words

structure, economical, element, history, arch, type, central, profile, section, geometry, control, circular, vertical, horizontal, meridian, line, result, system, experiment

2.6.5 Choose the proper English word

1 балка	a) column	b) beam	c) flooring
2 копия	a) counterpart	b) span	c) axis
3 сводчатый	a) tubular	b) vaultlike	c) rough
4 размер	a) stiffness	b) plywood	c) dimension
5 промежуток	a) gap	b) dome	c) shell
6 кирпичная кладка	a) girder	b) masonry	c) cast-iron
7 широта	a) magnitude	b) mass concrete	c) latitude

2.6.6 Find the English equivalents of the following Russian words

A поддерживать, консольная балка; ложная арка; выступать; передавать; вытеснить; нагрузка; чугун; ограничивать; расстояние между опорами

B to project; false arch; to restrain; span; to support; cast-iron; cantilever beam; to supplant; to transmit; load

2.6.7 Read the following word-combinations and translate them into Russian

important considerations; correct dimensions; structural elements; the chief means; ancient architecture; inclined toward one another; an inverted shape; true brick arches; to use concrete in place of stone; Middle Ages; a braced beam; simple timber arch; to rest upon a support; to project from a wall; counterpart of an arch; a vertical axis; to transmit loads; vaultlike form; to supplant masonry by concrete

2.7 Text 7 Estate agents' language

2.7.1 Listen to the text from the book "LISTEN TO BBC" by G.V. Terekhova. It can be found in OSU electronic library

3 Unit 3 The Profession of a Builder

There are many interesting and noble professions nowadays.

Why did you make up your mind to become a civil engineer?

Did anybody advise you to choose this career?

What can you say about the role of a civil engineer in civilized society?

3.1 Text 1 Engineering as a profession

3.1.1 Read and translate the text using the dictionary

Engineering is often compared to medicine and law in discussions of professional status. It would appear to qualify according to the dictionary meaning of the word. Engineering require specialized knowledge and intensive preparation with continued study after leaving the university. The profession has a strong organizational structure, requires high standards, and operates in the public service. These attributes are commonly associated with the word professional as it is used here. This is a rather restricted interpretation and it differs from its use in describing, say, a professional actor or sportsman who is paid for his efforts, as opposed to an amateur who performs for enjoyment. It is also sometimes used in reference to level of experience so that one speaks of a professional job house painting or plumbing. Another use refers to a continued effort over an extended period of time so that one hears reference to a "professional student" as one who spends many years at a university.

Most important is the fact that engineers see themselves as professionals. They have to be technically competent and operate with responsibility in conformity with accepted notions of professionalism.

The type of responsibility is rather different from a doctor. The doctor's

responsibility is clearly recognizable because of directness of a doctor's relationship. For the engineer, the result of his labors – be it a bridge, air-conditioning unit, automobile or computer – is interposed between himself and the user. However, since people's lives are often at stake if an error is made, a high level of competence is essential.

Engineering is somewhat tainted in the public eye. It is recognized that technology, or its misapplication, is responsible for the various pollution threats and also for devastating weapons of war, and the public assumes that it is the engineers who have brought us to this pass. It should be realized that technology, too operates according to demands, and just as the demand for goods, and comfort has led to environmental damage, so technology can also correct this. In one sense engineers with their machines are the tools of society, and it is society that ultimately determines how they are to be used.

The usual structure of engineering curricula includes four main components. First come the basic sciences of physics, chemistry and mathematics. Then a block of humanities courses is required. The engineering courses fall in the general areas of mechanics of solids, properties of materials, mechanics of fluids, thermodynamics, electrical science, transfer and rate processes and systems. Finally come the design courses which put it all together. It is this design discipline which exemplifies engineering in action, for it illustrates how engineers solve practical problems by applying their scientific knowledge and skills in the interactive decision-making process. This is how engineers adapt science to human needs.

3.1.2 Read the following words. Mind their meaning

large scale	крупномасштабный
residential buildings	жилые здания
honorable	благородный
scientific attitude	научный подход

judgment	взгляд, умение разбираться в чем-либо
modern conveniences	современные удобства
goal = aim	цель
to be engaged in something	заниматься чем-либо
effort	усилие, попытка
requirement	требование
advanced technology	передовая технология
to be familiar with	знать что-либо, быть в курсе чего-либо
experience	опыт, квалификация, мастерство
occupant	житель, обитатель
to render a service	оказать услугу
value	ценность, стоимость, цена

3.1.3 Read the following verbs. Mind their meaning. Pay attention to the principal forms

to carry out (- ed; - ed)	выполнять, проводить
to attract (-ed; - ed)	привлекать
to construct (- ed; -ed)	сооружать, конструировать
to build (built; built)	строить
to obtain (- ed; - ed)	получать, приобретать
to provide (- ed; -ed)	обеспечивать
to serve (- ed; - ed)	служить
to give (gave; given)	давать
to supervise (-ed; - ed)	наблюдать, заведовать
to know (knew; known)	знать
to satisfy (- ed; - ed) the needs	удовлетворять потребность

to determine (- ed; - ed)	определить
to reduce (- ed; - ed)	снижать
to revise (- ed; - ed)	изменять, пересматривать
to fall (fell, fallen)	падать
to sacrifice (- ed; - ed)	жертвовать
to be (was/were, been)	быть
to have (had, had)	иметь

3.1.4 Choose the proper English word

1.	приобретать	a) to determine;	b) to obtain;	c) to provide
2.	наблюдать	a) to supervise;	b) to reduce;	c) to change
3.	изменять	a) to sacrifice;	b) to revise;	c) to practice
4.	житель	a) value;	b) portion;	c) occupant
5.	опыт	a) purpose;	b) aim;	c) experience
6.	привлекать	a) to attract;	b) to modify;	c) carry out
7.	требование	a) design;	b) cost;	c) requirement
8.	цель	a) goal;	b) effort;	c) item
9.	благородный	a) civil;	b) honorable;	c) residential
10.	крупномасштабный	a) essential;	b) reasonable;	c) large scale

3.1.5 Find the English equivalents of the following Russian words

A. знать что-либо; взгляд; служить; обеспечивать; привлекать; заниматься чем-либо; выполнять; цель; опыт; снижать; попытка

B. experience; to attract; aim; to carry out; to serve; to reduce; to be familiar with something; judgment; to provide; to be engaged in something; effort.

3.1.6 Form all possible word-combinations

A. industrial	**B**. work
scientific	building
modern	elements
large	aim
essential	value
serious	profession
residential	requirement
honorable	attitude
fundamental	scale

3.1.7 Read the following word - combinations and translate them into Russian

housing construction; residential and industrial buildings; honorable profession; judgment, obtained by experience; the main aim; to provide with different types of buildings; the efforts of an engineer; such as; be directed towards the same goal; to prepare the plans and specifications; to supervise the construction; at the lowest practical cost; the duty of an engineer; to reduce the cost of the project; to change a design; to modify the requirements; to revise portions of specifications; in such a way; essential value; it seems evident; to render a real service to the client; have to combine

3.1.8 Read the text again and find out if the following statements are true or false

1. Building profession is not popular nowadays.
2. An engineer never supervises the construction of a project.
3. An engineer must receive a great deal of scientific training.
4. Civil engineers are engaged to prepare the plans of residential buildings only.

5. The main aim of civil engineer is to construct buildings with all modern conveniences.

3.1.9 Complete the sentences

1. Housing construction is being carried out on a …

a) same goal b) large scale c) modern conveniences

2. Builders construct residential and industrial…

a) specifications b) materials c) buildings

3. A civil engineer must have scientific …

a) requirement b) attitude c) value

4. An engineer is engaged to prepare plans and…

a) specifications b) constructions c) services

3.1.10 Find the passage describing the professional qualities of a civil engineer, translate it into Russian in written form

3.1.11 Answer the following questions in written form

1. What can you say about the level of housing construction in our country?
2. Why does the building profession attract so many young people nowadays?
3. Do you know what civil engineer construct and reconstruct at present?
4. What qualities must a person entering the building profession possess?
5. What is the main aim of a civil engineer?
6. What kind of training must a civil engineer receive?
7. Why should engineer be familiar with building methods, materials and equipment?

3.2 Text 2 How to design like an architect

3.2.1 Read and translate the text using the dictionary. Be ready to speak on the topic of the unit

Hi, I'm Doug Patt and this is How to design like an architect. I thought the best way to talk about design would be to create a dream home for someone, but first, let's talk about the design process. An architect, like any design professional draws on a wellspring of information. How we design is based to some extent on what we know. What we know can be based on the school we went to, the books we've read, the magazines we like to look at, where we grew up, our friends and relatives, the occupations we've held and in general, our life experiences. A professor named Edmund Bacon told me something once that I will never forget. He said, 'It's in the doing that the idea comes.' That is, we must sit and work through something before we can find the best way to solve a problem. Solving a design problem is essentially taking what we know and putting it together with that particular challenge. When an architect sits down to problem solve they frequently sketch. Sketching is one of the best ways to work out the solution to a problem. And I believe that it's exactly what Edmund Bacon meant when he said it's in the doing that the idea comes. Before we design our dream home I need to give you a little insight into one of my favorite architects. Le Corbusier was a Swiss born architect, writer and painter among other things. He was well known as a modern architect and for his theories & approach to architecture. I'll save his story for another episode, but would like to reference one of his most well known buildings. The Unite d'Habitation in Marseilles France is a very modern looking, long, narrow building that incorporates a number of Corbusiers design principals. The building is set on large concrete pilotis or pillars. It also incorporates a roof garden and sculpture. Although the style is seen as brutalist, it was Corbusier and his teams intention to create more suitable living accommodations for people who lived in congested cities. They did this by stacking narrow two story apartments rather than spreading them out over the landscape.

The buildings compact, lifted form was also seen as opening up the ground plane and providing the residents with a place of recreation on the roof. So, keep those things in mind as we look to design our dream home. This is Kelly. Kellys dream home is a house on a cliff overlooking the ocean in California. She loves modern architecture. Now for purposes of time constraints, I'm only going to design a small portion of the house and I'm going to do it quickly. So, it goes without saying that any architect worth their salt should be using a lot more information & spend a lot more time problem solving than I'm sharing with you here. Now, I assumed the site was narrow because of the scarcity of build able land in say Laguna Beach, CA. In that case I decided the home would be long and narrow, but tall. Every area has zoning ordinances that would probably affect the height of this building but I'm going to ignore them for this exercise. The house will be essentially a four-story window that points directly at the ocean view. Kelly wants to be a counselor so we know there should be some kind of space dedicated to having discussions and being inspired. A cantilevered deck is perfect for this. Now, an architect gets all kinds of useful information when interviewing a client for a job. Kelly's favorite building material is stainless steel so I decided to clad the whole house with it. Kelly also told me she had been born on an Indian reservation so I added this conical shape to the roof. A reference to the traditional American Indian tee pee. And there you have it. I put what I know together with the challenge of creating a dream home. SOME of what I referenced was work by Le Corbusier. What we've ended up with is a four story building set on pilotis. A home with a roof garden and roof sculpture that doubles as an observation deck. And finally, a long narrow building with stacked living accommodations and a breathtaking view. All put together, a dream home for Kelly. So remember. There's no one formula for design & this has simply been one way to get to a quick solution. Thanks for checking out how to design like an architect. I'm Doug Patt. If you want me to design your dream home just subscribe to my YouTube channel, then send me a message in the connect with section. If I get enough interest maybe I`ll pick you & design your dream home in an upcoming episode!

3.2.2 Answer the following questions

1. What University do you study at?
2. What faculty do you belong to?
3. When was it founded?
4. Are you a second-year student?
5. What specialities does the Auchitechture and Civil Engeneering faculty train?
6. Why do you want to become a civil engineer?
7. What subjects is the academic program composed of?
8. Why do the students study foreign languages?
9. What does the course of studies end with?
10. What problems do the students deal with in their course papers and graduation thesis?
11. Where do the graduates work?
12. What way can graduates continue their studies in?

3.2.3 Retell the text

3.3 Text 3 Going it Alone

3.3.1 Answer questions 1-17 by referring to the newspaper article about people who have set up their own businesses. For questions 1-17, match the statements on the left below with the list of people A-D. You may choose any of the people more than once

Which person: A Penny Sutton,
B Toby Alton,
C Ben Reilly,
D Nancy Brewerton.

aims to expand into export markets?	1	

admits to not being wholly truthful at one stage?	2	
persuaded clients to adopt certain procedures?	3	
accepted that their original plan was ill-founded?	4	
needed the support of experts in a related field?	5	
initially made no charge for the service provided?	6	
is somewhat alarmed at how quickly the business has taken off?	7	
fine-tuned the product in the light of feedback?	8	
works with a broader range of clients than was first nticipated?	9	
is relieved that a service they provide is not misused?	10	
provides a service which has social, economic and nvironmental benefits?	11	
researched a product that was already proving popular?	12	
turned a leisure activity into a business?	13	
responded to a request from a frustrated customer?	14	
was motivated to take a risk by changing personal circumstances?	15	
was advised to limit their horizons?	16	
made improvements to the product at an early stage?	17	

Small businesses are the engine-room of the economy. We spoke to four people who found they had the entrepreneurial spirit to set up their own business.

A

Frustration led to the setting up of Penny Sutton's company. She wanted a last-minute holiday in the sun, so she tapped into a travel website and up came an available destination. The price was right, but the resort wasn't one she'd come across before and the site gave no further information. After browsing for a while, she realised that in fact, nobody was producing reviews of holiday destinations of any description on the web.

Seeing a gap in the market, Penny decided to go for it, convincing three friends from university to join her. 'I rang my bank up and told them I wanted a loan to buy a car - a bit of a fib actually, because we used it to set up the website,' said Penny. Her idea was to let travellers tell their own tales. Subscribers were invited to write in with reviews and stories about places they'd visited. The goal was to build an Internet travel centre with the world's biggest database of personal travel information.

Before long, they had 24,000 subscribers and thousands of people were posting reviews on the site. The team edits the reviews for grammar, content, etc., but happily very few people use it as a chance to sound off against particular travel companies.' explains Penny, 'We might get into legal difficulties if anything like that got on the site. Fortunately, most people who post reviews just want to pass on details of a great meal, a hidden beach or a wonderful club.'

In their first year, the friends just eked out a living, finding it difficult to make enough money to develop their site, a problem they got round by selling their reviews on to other travel companies. 'We've become a service to the travel industry -allowing their customers to read reviews, look at maps and see which guidebooks to take,' says Penny, 'although that wasn't the original idea at all.' The only real problem for the four partners is finding the time to take the holidays that inspired setting up the site in the first place.

B

Toby Alton's daughter, Kylie, asked him to buy her an American sweet snack made from dried fruit when he was travelling in Florida. Some classmates had brought some back from a US holiday, and they'd become a 'must have' item at school, but no UK supplier stocked them. So, Toby dutifully popped into a US supermarket and was amazed to see a huge display in half a dozen different flavours. The holiday ended there and work began.

He took pictures, bought samples and pumped store managers for information. The minute he landed in Britain, he was on the phone to a friend, Dave Crouch. 'He was full of it, really excited,' says Dave. 'He'd identified a yawning gap in the British market for an innovative snack product that would gain the approval of health-conscious parents, without sacrificing its appeal to children.'

'Our first thought was to import the product from the USA,' explains Toby, 'but we soon realized that the cost of import duties and problems of supply made this impractical. We would have to develop and make our own products.'

Although they'd worked in the food industry, sales and marketing was their speciality, not food technology, so they consulted contacts in the industry to develop the products that are now their core business. Before long, they were selling nearly £250,000 worth of fruit snacks a month to food retailers. 'Our growth rate to date has been scarily fast,' says Toby, 'but we believe that there's a great deal more to come. Our ambition is to become the primary player in a new fruit snacks category across Europe, within the next four years.'

The key to their success, says Ian, is probably that they've touched a central nerve in the public psyche. 'We aren't health freaks, but we worry about what our children eat - I think it's a concern a lot of people share.'

C

In just three years, Ben Reilly's business has grown from one man in a Ford transit van to a company with a £4 million turnover. It was the combination of a new-born baby and the 'what if...' factor that convinced Ben that he should leave his secure job with a

major airline and go it alone. 'I couldn't bear the thought of getting old and wondering what could've been,' says Ben. 'But as my family responsibilities grew, it would get more difficult to leave a secure job. It was like now or never.'

He told his employers of his ambitions and they suggested that he use his flair within the sphere of activity he knew best - managing aeroplanes. 'My job was to handle the turnarounds: fuelling, cleaning and stocking of the planes. It had already struck me that there was an enormous amount of waste occurring because of the need for speed. Everything got thrown away - the headphones, and all the unused bits and pieces from the customer packs.'

Mark suggested that all the unused goods could be repackaged and most of the headphones cleaned, straightened.-.given new foam earpiece and reused. He convinced the airline to let him have a go, and made sure that cleaners were detailed to start sorting aeroplane rubbish into two bags - real rubbish and anything that was recyclable. If the seal is broken on anything, we chuck it, but if it's unbroken, it gets repackaged. Most of the headphones are easy to refit.' A friend told him of a local disabled group that was looking for work. He offered them the job of repackaging. 'It's worked remarkably well and what began as a One-off arrangement is now a company commitment. When we began, our aim was to turn around 3000 items a week,' says Ben. Today his company reconditions 350,000 a week - saving the airline 40% of what they once spent on kits for passengers.

D

Nancy Brewerton was well aware of the frustration of the teachers she saw every day as an information technology adviser for a local education authority. A former primary school teacher, Nancy believed that use of the computer and the Internet should and could be integrated into the educational curriculum.

She started tinkering at home with an idea for an Internet resource centre that would help children use the net for education both at home and at school. It soon

became more than a hobby, and Nancy went into partnership with her friend, Sally Ayers, an expert in marketing and advertising, to develop the idea.

With the help of seven private investors, they set up a website. Version one was launched in January; version two, with upgraded design and navigation, followed in October. At first, they allowed schools to use the site in return for user reports from teachers, which gained them both credibility and ideas for refinements. But the ultimate key to its success, says Nancy, is that it's interactive and user friendly: 'It allows children to use the computer in a purposeful way, geared to learning at school.' The site does not take advertising and relies on subscriptions, which Sally and Nancy started selling two months ago: already 700 schools have signed up.

3.3.2 Read and translate the text using the dictionary. Be ready to speak on the topic

3.4 Text 4 My Early Life

3.4.1 You are going to read the start of a book called *My Early Life* by Sir Winston Churchill, who was once the British Prime Minister. For questions 1-7, choose the answer (A, B, C or D) which you think fits best according to the text

Various accounts have appeared from time to time of my early life and adventures, and I myself having published thirty years ago stories of the several campaigns in which I took part, and having written later about particular episodes, I have thought it right to bring the whole together in a single complete story; and to tell the tale, such as it is, anew. I have therefore not only searched my memory, but I have most carefully verified my facts from the records which I possess. I have tried, in each part of the quarter-century in which this tale lies, to show the point of view appropriate to my years, whether as a child, a schoolboy, a cadet, a subaltern, a war-correspondent or a youthful politician. If these opinions conflict with those now generally accepted

they must be taken merely as representing a phase in my early life and not in any respect, except where the context warrants, as modern pronouncements.

When I survey this work as a whole I find I have drawn a picture of a vanished age. The character of society, the foundations of politics, the methods of war, the outlook of youth, the scale of values, all are changed, and changed to an extent I should not have believed possible in so short a space without any violent domestic revolution. I cannot pretend to think that they are in all respects changed for the better. I was a child in the Victorian era, when the structure of our country seemed firmly set. In those days, the dominant forces in Great Britain were very sure of themselves and of their doctrines. They thought they could teach the world the art of government and the science of economics. They were sure they were supreme at sea and consequently safe at home. They rested therefore sedately under the convictions of power and security. Very different is the aspect of these anxious and dubious times. Full allowance for such changes should be made by friendly readers.

I have thought that it might be of interest to the new generation to read a story of youthful endeavour, and I have set down candidly and with as much simplicity as possible my personal fortunes as far as I could remember them.

When does one first begin to remember? When do the wavering lights and shadows of dawning consciousness cast their print upon the mind of a child? My earliest memories are set in Ireland. I can recall scenes and events in Ireland quite well; and sometimes, dimly, even people. Yet I was born on November 30, 1874, and I left Ireland early in the year 1879.1 nonetheless have clear and vivid impressions of some events. For example, I remember an occasion when we were to go to a pantomime. There was great excitement about it. We started from our official residence and drove to a castle, where other children were ho doubt to be picked up. Inside the castle was a great square space paved, I remember, with small oblong stones. It rained. It nearly always rained - just as it does now. People came out of the door of the castle, and there seemed to be much stir. It turned out that we could not go to the pantomime because the theatre had

burned down. All that was found of the manager was the keys that had been in his pocket.

We were promised as a consolation for not going to the pantomime to go next day and see the ruins of the building. I wanted very much to see the keys but this request does not seem to have been well received.

1 Churchill says he is writing the book to

A bring the account up to date.

B collect everything together in one book.

C get facts correct.

D make the story sound fresh and new.

2 The book mostly shows

A what Churchill thought at the time things happened.

B Churchill's views at the time he wrote it.

C the views that are generally accepted.

D the latest ideas, where these fit into the book as a whole.

3 The second paragraph refers to a change

A in family life.

B from stability to instability.

C from Britain being a confident nation to a nervous one.

D from Britain being well defended to being at risk of attack.

4 Churchill thinks that readers may not appreciate his book unless they understand

A how attitudes have changed.

B that Churchill now feels worried and unsure of himself.

C why opinions in the book may differ from theirs.

D that some things are told from a child's or young person's point of view.

5 Churchill is struck by the fact that his first memories

A date from when he was very young.

B throw light on a child's first thoughts and ideas.

C are so clear and vivid.

D are often of ordinary people and things.

6 Judging by the first paragraph of the passage, the statement 'all that was found of the manager was the keys that had been in his pocket' is likely to be

A true.

B a story the children made up.

C a story the adults made up.

D something Churchill read later.

7 It seems from the passage that Churchill grew up in

A a poor family.

B a family that owned a lot of land.

C a military family.

D a family that had an important role in government.

3.5 Text 5 What Does a Composite Engineer Do?

3.5.1 Read and translate the text using the dictionary

A composite engineer is an engineer tasked with a range of technical, production process, and administrative responsibilities in companies that produce composite materials or use them for the construction of their products. Composites occur naturally or are manufactured from two or more different materials combined into a single end product. The composite engineer is typically expected to oversee the production of composite materials or products, to make informed choices on the materials and processes used, and to develop and institute programs or systems that enhance the end product and profitability of the business. Most companies looking for composite engineers require that prospective candidates be in possession of a degree in either mechanical or chemical engineering and have solid experience in the composites

disciplines relevant to their business. Preference is often given to those with experience in composite formulation, design and production techniques, and materials.

The role of a composite, or more accurately composites, engineer is a critical one in any facility producing composites or manufacturing products from them. Composite science is a combination of mechanical and chemical entities and requires close attention to detail and a deep understanding of its complexities when applied to the manufacture of commercial composite products. The composite engineer is responsible for applying this science to the day-to-day production activities in a composite-based business. These activities are generally centered around the materials used for production, the production processes and related systems, as well as any related logistic and administrative functions.

The materials used to make composites are diverse, with many standard components featuring extensive ranges of possible characteristic-enhancing additives. This is particularly true of resins used for reinforced plastic composites. The composite engineer in such a facility, for example, is responsible for choosing base resins, additives, and reinforcing materials that produce finished materials that best suit process or client requirements. The engineer will also have to decide on the best manufacturing process for the particular project. These responsibilities require a well-established knowledge of the materials and processes involved in any particular composite production arena.

The composite engineer is also typically required to institute peripheral systems to ensure smooth and profitable production. These may include inventory related issues, safety, and housekeeping policies or process procedures. The engineer may also be called upon to discharge process-related administrative duties such as purchasing of materials, invoicing, and supplier liaison. The formulation, implementation, and maintenance of relevant inventory control and store-keeping policies and procedures is also typically the responsibility of the composite engineer. Generally, most companies

require a potential candidate to hold a relevant mechanical or chemical engineering degree in addition to at lease three years of composite production or design experience.

3.5.2 Answer the following questions

1. What is the composite engineer typically expected?
2. Who is often given preference to?
3. What is the composite engineer responsible for?
4. What are the responsibilities of the composite engineer?

3.5.3 Retell the text

3.6 Text 6 How Do I Become a Composite Engineer?

3.6.1 Read and translate the text using the dictionary

In nearly all cases, at least a bachelor's degree in engineering is required to become a composite engineer. There are several engineering degrees that hiring companies may accept including chemical, manufacturing, or mechanical engineering. Although general engineering degrees may be accepted, you should research universities in order to find a school that offers a degree program in composite material engineering. Programs that emphasize this branch of engineering will provide you with field specifics that will prepare you to become a composite engineer. A bachelor's degree may help you gain an entry-level position in this profession but a higher degree can prepare you for additional career opportunities.

A bachelor's program in composite material engineering will require that you take several courses in calculus, physics, and chemistry before advancing to courses in your field. Some of the courses that will prepare you to become a composite engineer include polymer processing, mechanics of composites, thermodynamics, and heat and mass transfer. Courses that are accompanied by laboratory sessions will provide you with hands-on training and this courses could include fluid mechanics, composite

manufacturing, and transport phenomena. You may need to complete several of these laboratory classes before applying to an internship in the field.

In addition to the completion of several field-related courses, some internships may require that you have at least a 2.50 grade point average (GPA) and strong written skills. Some of the duties of the internship may include preparing or modifying engineering diagrams, performing research on composite materials, and data analysis. Experience opportunities can increase your chances to become a composite engineer because future employers will be interested in your proficiency in the field. During your four year degree program, you may want to consider seeking part-time employment in the field or completing several internships in different positions.

Employers in this profession will be seeking candidates who have experience performing numerous duties in the field and may require recommendation letters from previous supervisors. Once you have become a composite engineer, you may want to search the Internet and local newspapers for job listings. Some of the companies that employ this position may include aviation companies, catalytic technology groups, and aeronautical design firms. Most companies that hire applicants who have a bachelor's degree in the field may still require that you have at least three to five years of experience. If you choose to enroll in graduate school, you may want to consider working on a master's degree in polymer or composite engineering.

3.6.2 Be ready to discuss the topic of the unit

3.7 Text 7 The extinction of men

3.7.1 Listen to the text from the book “LISTEN TO BBC” by G.V. Terekhova. It can be found in OSU electronic library

4 Unit 4 Modern construction

4.1 Text 1 Dubai tower tallest building in the world

URL: http://www.breakingnewsenglish.com/0707/070723-burj_dubai.html

4.1.1 Read the text

A building developer in the United Arab Emirates has claimed the record for the world's tallest building. Emaar Properties says its Burj Dubai tower, still under construction, has reached a height of 512.1 meters and 141 storey. The current record holder, Taiwan's Taipei 101 building is 508 meters and 101 storey. The Burj Dubai is expected to be finished in 2008 and will reach nearly 700 meters in height, with approximately 160 storey. The exact final height is being kept a closely guarded secret by the developer, presumably to prevent other constructers from challenging the record. Taipei 101 will keep the official "tallest building" record until the Council on Tall Buildings and Urban Habitat, which sets the criteria for achieving height records for buildings, evaluates the Burj Dubai in late 2008.

Dubai is currently undergoing a construction boom and the Burj Dubai is the centerpiece of a $20 billion residential and commercial project, which will boast the world's largest shopping mall. However, there have been many criticisms of the working conditions for builders in Dubai. In 2006, a Human Rights Watch report on the treatment of migrant workers, entitled "Building Towers, Cheating Workers", documented labor abuses. It highlighted "extremely low wages…the withholding of employees' passports, and hazardous working conditions that result in apparently high rates of death and injury." The salaries of migrant construction workers in Dubai range from $106 to $250 per month, while the national average wage is over $2,000 per month. Trade unions remain illegal in the UAE.

4.1.2 Talk about how useful these are in apartment buildings. Rank them in order of which you would prefer to have

- shopping mall
- hospital
- train station
- swimming pool
- rooftop park
- restaurants

- cinema
- other _____

4.1.3 What do you know about these buildings? Talk about them with your partner(s). What goes through your mind when you see them? Change partners and share what you said and heard

- The Pyramids
- The White House
- Buckingham Palace
- The Eiffel Tower
- Sydney Opera House
- The Kremlin
- The Taj Mahal
- The Burj Al Arab Hotel

4.1.4. Look at the article's headline and guess whether these sentences are true (T) or false (F)

a. A UAE sheikh has said the world's tallest building is in his country. T / F
b. The tall building was completed last week. T / F
c. The exact height of the building is top secret. T / F
d. The height record will be confirmed towards the end of 2008. T / F
e. Dubai is currently experiencing a slowdown in construction growth. T / F
f. The tall building will also house the world's largest shopping mall. T / F
g. A human rights group is concerned about working conditions. T / F
h. Dubai builders earn around a tenth of the national average wage. T / F

4.1.5 Match the following synonyms from the article

1. building *a*. metropolitan

2	storey	*b.*	dangerous
3.	guarded	*c.*	experiencing
4.	presumably	*d.*	floor
5.	urban	*e.*	probably
6.	undergoing	*f.*	traveling
7.	boast	*g.*	construction
8.	migrant	*h.*	possess
9.	hazardous	*i.*	outlawed
10.	illegal	*j.*	protected

4.1.6 Match the following phrases from the article (sometimes more than one combination is possible)

1.	claimed the record	*a.*	residential and commercial project
2	still under	*b.*	employees' passports
3.	being kept a closely	*c.*	the world's largest shopping mall
4.	prevent other constructers from	*d.*	a construction boom
5.	sets the criteria for	*e.*	challenging the record
6.	Dubai is currently undergoing	*f.*	illegal
7.	the centrepiece of a $20 billion	*g.*	achieving height records
8.	boast	*h.*	for the world's tallest building
9.	the withholding of	*i.*	guarded secret
10.	Trade unions remain	*j.*	construction

4.1.7 Put the words into the gaps in the text

A building developer in the United Arab Emirates has _____ the record for the world's tallest building. Emaar Properties says its Burj Dubai tower, still _____ construction, has reached a height of 512.1 metres and 141 storeys. The current record _____, Taiwan's Taipei 101 building is 508 metres and 101 storeys. The Burj Dubai is _____ to be finished in 2008 and

exact
expected
under
challenging
claimed
guarded

will reach nearly 700 metres in height, with approximately 160 storeys. The _____ final height is being kept a closely _____ secret by the developer, presumably to prevent other constructers from _____ the record. Taipei 101 will keep the official "tallest building" record until the Council on Tall Buildings and Urban Habitat, which sets the _____ for achieving height records for buildings, evaluates the Burj Dubai in late 2008.

Dubai is currently undergoing a construction _____ and the Burj Dubai is the centrepiece of a $20 billion residential and commercial project, which will _____ the world's largest shopping mall. However, there have been many _____ of the working conditions for builders in Dubai. In 2006, a Human Rights Watch report on the _____ of migrant workers, entitled "Building Towers, Cheating Workers", documented labour _____. It highlighted "extremely low wages…the withholding of employees' passports, and hazardous _____ conditions that result in apparently high rates of death and injury." The salaries of migrant construction workers in Dubai _____ from $106 to $250 per month, while the national average wage is over $2,000 per month. Trade unions _____ illegal in the UAE.

criteria
holder
working
criticisms
remain
boom
abuses
boast
range
treatment

4.1.8 Put the words into the gaps in the text

Dubai tower tallest building in the world

A building developer in the United Arab Emirates has _____ the world's tallest building. Emaar Properties says its Burj Dubai tower, still under construction, has _____ 512.1 meters and 141 storey. The current record holder, Taiwan's Taipei 101 building is 508 meters and 101 storey. The Burj Dubai is _____ in 2008 and will reach nearly 700 meters in height,

with approximately 160 storey. The exact final height is being kept _____ by the developer, _____ other constructers from challenging the record. Taipei 101 will keep the official "tallest building" record until the Council on Tall Buildings and Urban Habitat, _____ achieving height records for buildings, evaluates the Burj Dubai in late 2008.

Dubai is _____ construction boom and the Burj Dubai is the centrepiece of a $20 billion residential and commercial project, which will _____ shopping mall. However, there have been many criticisms of the working conditions for builders in Dubai. In 2006, a Human Rights Watch report _____ migrant workers, entitled "Building Towers, Cheating Workers", documented labour abuses. It highlighted "extremely low wages…_____ employees' passports, and hazardous working conditions _____ high rates of death and injury." The salaries of migrant construction workers in Dubai range from $106 to $250 per month, while the national average wage is over $2,000 per month. Trade _____ in the UAE.

4.1.9 Look in your dictionaries / computer to find collocates, other meanings, information, synonyms … for the words **'building'** and **'developer'**

building	**developer**

4.1.10 Look at the words below. With your partner, try to recall exactly how these were used in the text:

• claimed	• boom

• under • current • exact • urban • late	• boast • criticisms • abuses • rates • remain

4.1.11 Write five GOOD questions about TALL BUILDINGS in the table. Do this in pairs. Each student must write the questions on his / her own paper. When you have finished, interview other students. Write down their answers

	STUDENT 1 _____	STUDENT 2 _____	STUDENT 3 _____
Q.1.			
Q.2.			
Q.3.			
Q.4.			
Q.5.			

4.1.12 Answer these questions

1. What did you think when you read the headline?
2. Are you interested in tall buildings?

3. Would you like to live at the top of the world's tallest building?

4. Why do cities want to boast the world's tallest building?

5. Do you think buildings need to be so tall?

6. What are the good and bad things about living in a skyscraper?

7. How high do you think developers can build buildings?

8. Why do you think the developer is keeping the exact height of the building a closely guarded secret?

9. How do you think the owners of Taipei's 101 building feel about being second tallest?

10. What tall buildings are there in your town?

4.1.13 Be ready to discuss the topic according to these questions

1. Did you like reading this article?

2. What do you know about the construction boom in Dubai?

3. Is there a lot of construction going on in your town?

4. Would you like to visit the world's largest shopping mall?

5. How are construction workers treated in your country?

6. Do you think Human Rights Watch has any impact in protecting the rights of migrant workers?

7. Why do you think construction workers are still treated so badly in the twenty-first century?

8. Is it right that builders in the UAE receive a tenth of the national average wage?

9. What do you think of making trade unions illegal?

10. Did you like this discussion?

11. What was the most interesting thing you heard?

12. Was there a question you didn't like?

13. Was there something you totally disagreed with?

14. What did you like talking about?
15. Which was the most difficult question?
16. Have you been to Dubai? What was your impression?

4.1.14 Find the correct word

Dubai tower tallest building in the world

A building developer in the United Arab Emirates has (1) ____ the record for the world's tallest building. Emaar Properties says its Burj Dubai tower, still (2) ____ construction, has reached a height of 512.1 metres and 141 storeys. The current record (3) ____, Taiwan's Taipei 101 building is 508 metres and 101 storeys. The Burj Dubai is expected to be finished in 2008 and will reach nearly 700 metres in height, with approximately 160 storeys. The exact final height is being kept a (4) ____ guarded secret by the developer, (5) ____ to prevent other constructers from challenging the record. Taipei 101 will keep the official "tallest building" record until the Council on Tall Buildings and Urban Habitat, which sets the criteria for achieving height records for buildings, evaluates the Burj Dubai in (6) ____ 2008.

Dubai is currently (7) ____ a construction boom and the Burj Dubai is the centrepiece of a $20 billion residential and commercial project, which will (8) ____ the world's largest shopping mall. However, there have been many (9) ____ of the working conditions for builders in Dubai. In 2006, a Human Rights Watch report on the treatment of migrant workers, entitled "Building Towers, Cheating Workers", (10) ____ labour abuses. It highlighted "extremely low wages…the (11) ____ of employees' passports, and hazardous working conditions that result in apparently high rates of death and injury." The salaries of

migrant construction workers in Dubai range from $106 to $250 per month, while the national average wage is over $2,000 per month. Trade unions (12) ____ illegal in the UAE.

1.	(a)	claimed	(b)	clapped	(c)	clammed	(d)	clamped
2.	(a)	with	(b)	under	(c)	over	(d)	by
3.	(a)	holding	(b)	holds	(c)	hold	(d)	holder
4.	(a)	closet	(b)	closed	(c)	closely	(d)	close
5.	(a)	presume	(b)	presumption	(c)	presuming	(d)	presumably
6.	(a)	latter	(b)	last	(c)	late	(d)	lately
7.	(a)	undergoing	(b)	under	(c)	underage	(d)	underground
8.	(a)	boost	(b)	boast	(c)	beast	(d)	best
9.	(a)	criticizes	(b)	critic	(c)	critical	(d)	criticisms
10.	(a)	documented	(b)	document	(c)	documentary	(d)	documents
11.	(a)	within	(b)	withering	(c)	withholding	(d)	withdrawn
12.	(a)	still	(b)	remain	(c)	remains	(d)	continue

4.2 Text 2 Home sweet Home

4.2.1 Read the text

When the first settlers came to America, there were no homes waiting for them. In order to survive, the newcomers quickly constructed rough shelters, which would serve until more permanent homes could be built. A site was usually selected near a pond or stream since water was so necessary for drinking, cooking, and washing; for feeding the livestock, watering crops, and - in some cases - turning waterwheels to provide power. Some of the first temporary homes of the early settlers were no more than covered holes dug in the ground, or roughly made huts of piled logs and bark. But as settlers continued to arrive in the New World, real houses began to appear.

The early houses were not designed by architects, nor built by contractors! Everything - including planning, clearing the land, cutting the lumber, gathering the stones, and construction itself - was done by the owner-to-be with help from his neighbors. American climate and materials were often unlike those of the settler's homeland, and tools were hard to come by. Settlers really had to start from scratch.

At first, logs were either used whole, or boards were made by hand-splitting logs into planks, using wedges and a very large, heavy wooden mallet. Where trees were plentiful, log cabins were built, using only an ax and handsaw. (The advantage of the log cabin was that it could be constructed quickly by a single man. On the Plains, where there were no trees, the settlers chopped the hard earth into sod "bricks," and used the sod like bricks for building.

4.2.2 Answer the questions

1. Why did the newcomers quickly construct rough shelters, which would serve until more permanent homes could be built?

2. What did the first temporary homes of the early look like?

3. Who designed and built the early houses ?

4. American climate and materials were the same those of the settler's homeland, weren’t they?

5. What did the settlers use for the construction of buildings?

4.2.3 Retell the text

4.3 Text 3 Held together with mud

4.3.1 Read the text

Without nails, the settlers used clay and mud to fasten wood together, and posts were held to beams by carefully fitted wooden pegs. Depending on the climate, roofs were made flat, for easy construction, or steeply pitched to shed the winter snow. Because cut-wood roof shingles needed to age before they could be put up, temporary roofs, made of tree bark or thatched with straw, were erected. Some home builders tried to hurry the process, believing the superstition that newly cut shingles put on in j the moonlight would not curl as the wood dried.

Houses were not constructed all at once, but gradually completed and improved as time and resources allowed. As a family grew or acquired wealth, the family home became larger, more elaborate, frequently reflecting the architectural styles of the settler's homeland. Depending on the materials available, the English built what we now call colonial, cape, and saltbox style wooden homes, similar in style to the homes of rural England. The Dutch built "stepped roof colonial homes of brick. Many of the German and Swedish colonists constructed their houses from stones cleared from their farmlands and the French and Spanish had their "old country" styles as well.

Machines, too, helped the American home to grow. By the middle of the 1800's sawmills operating near large cities produced ready-cut "dimension lumber" like the "two-by-fours" (2x4) we use today. Machines were also developed to produce nails. Dimension lumber and nails meant that houses were easier to build, but at first there was concern that a strong wind might blow these largely wooden homes clear off the ground, "like a balloon'.

However, these early "balloon frame" houses, as they were properly called, proved to be sturdy. We still build houses in that way today.

Whatever the building material or style, nearly all Early American homes - the basic American home - followed the same interior plan: one large room with a single central fireplace or two fireplaces, one at either end of the house. The fireplace was the focal point of the house. It provided heat for cooking, warmth from the cold, and some light during the evening hours. The fireplace room was used as the kitchen, the dining room, the living room, and also the bedroom. The fire was so important - and so difficult to re-light if it went out - that it was kept going day and night, summer and winter. Around the fireplace hung gadgets galore. Not only pots, pans, and cooking implements, but homemade devices for cracking nuts, washing clothes, warming cold beds, and many things that look today like abstract sculpture, so difficult is it to recognize their function.

4.3.2 Answer the questions

1. What were roofs made depending on the climate? Why?
2. Who built stepped roof colonial homes of brick?
3. What way did many of the German and Swedish colonists construct their houses?
4. The French and Spanish had their "old country" styles as well, didn't they?
5. What types of machines were also developed?
6. What was the focal point of the house? Why?

4.4 Text 4 Simple dirt floors

4.4.1 Read the text

Inside walls in the very early homes were bare structure or structure covered with boards. In the fancier homes the boards were covered with a type of plaster made from ground up seashells, sand, and water. Paint was scarce and used only as decoration. There was no plumbing or running water, so all water used for cooking, drinking, and washing had to be hauled in buckets to the house from a nearby stream or a hand-dug water well.

Before a wooden floor was laid - which might be postponed for years in favor of other more important tasks - the plain dirt floor was pounded hard and swept each day. The dirt floor was especially suitable for scratching out games and drawing plans. When company was expected, fancy designs and patterns were scratched in the floor to make a "dirt carpet".

At first windows were only open holes in the walls that could be closed with shutters. Some window holes were covered with oiled paper. The oil made the paper translucent so that some light would pass through, and the paper kept out the wind and rain. Before sheet glass became available, some families made "glass" windows by piling up glass bottles in the window hole. Even the glass windows that were available were full of sags and bubbles that made things seen through them appear ripply and distorted. And only ten pieces of glass were allowed in a home before a special tax had to be paid. Glass was so valuable in Early America that when a family moved they took their glass windows with them.

Sometimes a loft or second-floor level was built in the house to make extra room. The loft was accessible by a ladder and was where the children often slept. The loft was a snug, safe-feeling place, and the warmest spot in the house due to the rising heat from the fireplace.

4.4.2 Answer the questions:

1. What were the boards covered with?

2. Were there any facilities in early houses?

3. How did people use the dirt floor?

4. What did windows look like?

5. How many pieces of glass were allowed in a home before a special tax had to be paid?

6. Why did a family take their glass windows with them when they moved to another place?

7. Why was the loft the warmest spot in the house?

4.5 Text 5 Adding on buildings

4.5.1 Read the text

The house was built first, but it didn't stand alone for long. Barns were built to keep livestock and provide a working space. Corncribs, mounted off the ground to keep the mice away, stored the corn harvest until it was used. The smokehouse - which frequently burned down and was, therefore, kept a good distance from the main house - was used to cure meats and give them a good flavor as well as to preserve the meat from spoilage. The cellar of a house was the place to store food. It kept food cool in the summer and from freezing in the winter. The cellar, however, was not necessarily under the house, but beside it - a pit or room-in-the-ground on the sunless north side. Depending on any other trades the farmer was skilled at, he might have a forge barn for shaping iron, a grist mill for grinding grain, or possibly even a ropewalk. And, of course, an outhouse - an outdoor toilet. Even in Early America, and | especially at public buildings, there were sometimes separate outhouses for men and women. The half-moon symbol or "luna" meant the outhouse was for women and the sun symbol or "sol" meant it was for men. In the colder New England climates the outbuildings were attached to the main house. (It is interesting to note that some New England homes built by the sea had a small fenced-in platform perched atop the highest point of the roof called "a captain's walk" or a "widow's walk." The walk was reached through a trapdoor in the ceiling and provided a sea captain, or the wife of a ship's captain who was at sea, with a view of the harbor and all incoming ships.)

Our homes today still reflect the styles of the Early American builders. Much of the building technology has changed over the years, however. We still use dimension lumber, but we also have the convenience of poured concrete, aluminum siding, plaster wallboard, smooth clear glass, central heating and air conditioning systems, indoor plumbing, and, of course, a slew of electrical conveniences.

The fireplace is no longer a necessity in most homes, but we still like to build them into our homes for the warmth and atmosphere they create. Gone are most of the outbuildings -barns, smokehouses, and so on - because we now buy most of the things we need rather than produce them ourselves. As our life-styles change, so do our houses change to reflect our new habits and ways of life. What will our houses be like in the future? Think about energy, recreation, food production, and safety, and try to imagine your house twenty-five years from now.

A house, once constructed, becomes a valuable family asset. Unless it has deteriorated beyond repair due to damage or neglect, it is rarely torn down, but rather improved, enlarged, and made more modern, in keeping with newer life-styles and conveniences. Many homes built by the settlers and colonists over two or three hundred years ago have been refurbished and modernized, and are still comfortably lived in today.

4.5.2 Translate the first passage of the text in written form

4.5.3 Retell the text

5 Unit 5 Supplementary reading

5.1 Text 1 How Do Real Estate Agents Get Paid?

5.1.1 Read the text

http://www.investopedia.com/articles/personal-finance/080714/how-do-real-estate-agents-get-paid.asp

If you're in the market to buy or sell a home, odds are you'll work with a real estate agent to help you through the process. According to the 2013 Profile of Home Buyers and Sellers published by the National Association of Realtors, 88% of buyers purchased their home through a real estate agent or broker, a share that has been

increasing steadily from 69% in 2001. The vast majority of sellers also relied on real estate agents; only 9% of sellers sold their homes on their own. During 2013, the mean annual wage for real estate sales agents was $50,940, according to employment data from the Bureau of Labor Statistics. How much money agents make each year depends on a number of factors, including the number of transactions they complete, the commission paid to the brokerage and the agent's spilt with the sponsoring broker. Here, we take a look at how real estate agents are paid.

Real Estate Commissions

Most real estate agents make money through commissions – payments made directly to real estate brokers for services rendered in the sale or purchase of real property. A commission is usually a percentage of the property's selling price, although it can be a flat fee. To understand how real estate agents are paid, it helps to know about the relationship between an agent and a broker. Both agents and brokers are licensed by the state in which they work. Agents are licensed salespersons who work *for* and *under* the umbrella of a designated broker. Agents cannot work independently, and they are prohibited from being paid a commission directly by consumers. Brokers, on the other hand, are able to work independently and/or hire real estate agents (salespersons). All real estate commissions must be paid directly to a broker, then the broker splits the commission with any other agents involved in the transaction. The broker's compensation is specified in the listing agreement, a contract between a seller and the listing broker that details the conditions of the listing. The rate of the broker's commission is negotiable in every case; in fact, it is a violation of federal antitrust laws for members of the profession to attempt, however subtly, to impose uniform commission rates. Commissions are taken out of the sale proceeds, and it's usually the seller who pays the commission, unless the buyer and seller negotiate a split. Most sellers factor the commission into the asking price, so it can be argued that the buyer pays at least some of the commission in either case (due to the higher asking price).

Sharing Commissions

Real estate commissions are often shared among many people. In a typical real estate transaction, the commission might be split four ways, among the:

Listing agent – the agent who took the listing from a seller

Listing broker – the broker for whom the listing agent works

Buyer's agent – the agent who represents the buyer

Buyer's agent's broker – the broker for whom the buyer's agent works

To illustrate, let's assume an agent takes a listing on a $200,000 house at a 6 % commission rate. The house sells for the asking price, and the listing broker and the buyer's agent's broker each get half of the commission, or $6,000 each ($200,000 sales price x 0.06 commission ÷ 2). The brokers then split the commissions with the agents. A common commission split gives 60 % to the agent and 40% to the broker, but the split could be 50/50, 60/40, 70/30 or anything else that the agent and broker have agreed upon. In a 60/40 split, each agent in our example would receive $3,600 ($6,000 X 0.06), and each broker would keep $2,400 ($6,000 X 0.04). The final commission breakdown would be:

Listing agent - $3,600

Listing broker - $2,400

Buyer's agent - $3,600

Buyer's agent's broker - $2,400

Sometimes commissions are split among fewer parties. If a broker lists a property and then finds a buyer, for instance, he or she would keep the full 6 % (or other agreed-upon rate) commission. Or, if a listing agent also sells the property (acting as both listing agent and buyer's agent), he or she would split the commission only with his or her sponsoring broker. If the commission were $12,000 as in the previous example, the broker would keep $4,800 and the agent would receive $7,200, assuming the same 60/40 split.

Of course, as in other professions, earnings are often eroded by taxes and business

expenses. Federal, state and self-employment taxes, along with the costs of doing business (insurance, dues and fees, MLS fees, advertising, etc.), can end up taking sizable chunks out of otherwise substantial commissions.

No Settlement = No Pay (But Not Always)

In general, commissions are paid only if and when a transaction settles. There are instances, however, when a seller is technically liable for the broker's commission even if the transaction is not closed. If the broker has an offer from a ready, willing and able buyer, the broker may still be entitled to a commission if the seller:

has changed his/her mind and refuses to sell to you.

has a spouse who has refused to sign the deed (if that spouse had signed the listing agreement).

has a title that contains uncorrected defects.

commits fraud in regard to the transaction.

cannot deliver possession to the buyer within a reasonable time.

insists on terms that were not in the listing agreement.

has mutually agreed with the buyer to cancel their transaction.

In some cases, real estate agents are employed by, and paid a salary by, their broker.Redfin.com, for example, is an online property search site that employs a staff of full-service real estate agents who are paid a salary plus a commission dependent upon customer satisfaction ratings collected by the company. It is far more common, however, for agents to be paid a percentage of the commission.

The Bottom Line

Most real estate agents make money through commissions paid directly to brokers when transactions are settled. A single commission is often split multiple ways among the listing agent and broker, and the buyer's agent and broker. The commission split a particular agent receives depends on the agreement the agent has with his or her sponsoring broker. It is common for more experienced and top-producing agents to receive a larger percentage of the commission.

5.2 Text 2 The Unseen History of Our Roads

http://www.roadandtrack.com/car-culture/a4447/the-road-ahead-road-evolution/

5.2.1 Read the text

Thousands of years before urban planning, motor vehicles, or even the wheel, the first roads appeared on the landscape. Just as molecules coalesced into cells and cells into more complex organisms, our first roads were spontaneously formed by humans walking the same paths over and over to get water and find food. As small groups of people combined into villages, towns and cities, networks of walking paths became more formal roads. Following the introduction of the wheel about 7,000 years ago, the larger, heavier loads that could be transported showed the limitations of dirt paths that turned into muddy bogs when it rained. The earliest stone paved roads have been traced to about 4,000 B.C. in the Indian subcontinent and Mesopotamia.

To help support the movement of legions throughout their empire, the Romans developed techniques to build durable roads using multiple layers of materials atop of deep beds of crushed stone for water drainage. Some of those roads remain in use more than 2,000 years later, and the fundamental techniques form the basis of today's roads.

Modern road-construction techniques can be traced to a process developed by Scottish engineer John McAdam in the early 19th century. McAdam topped multi-layer roadbeds with a soil and crushed stone aggregate that was then packed down with heavy rollers to lock it all together. Contemporary asphalt roads capable of supporting the vehicles that emerged in the 20th century built upon McAdams' methods by adding tar as a binder.

The actual process of road building has changed dramatically over the past century, going from large gangs of workers with picks and shovels to enormous specialized machines. Rebuilding existing roads starts with peeling up existing pavement, grinding it and dumping it straight into trucks for reuse later as aggregate for

new roads. After grading the surface, pavers come in and lay down fresh, continuous sheets of asphalt followed directly by the rollers.

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Building or expanding modern roads is a complex undertaking that can cost anywhere from $2 to12 million per mile depending on the number of lanes and the location. A great deal of consideration must be put into where roads should go in order to minimize disruptions and the make them as direct as possible, while simultaneously keeping slopes reasonable in hilly areas for performance and safety reasons.

Given the economic and political complexities of building new roads, autonomous vehicles being developed by everyone from Audi and General Motors to Google may turn out to be the best long-term solution to addressing congestion and safety. These self-driving vehicles use arrays of sensors to monitor their surroundings, and wireless communications to talk to each other and the cloud. At some point in the foreseeable future, instead of adding more lanes to highways, we may actually be able to reduce them as we shift to vehicles that can see and hear far more than human drivers, enabling them to drive closer together while still avoiding collisions, thus requiring less roadway.

5.3 Text 3 Decent roads

5.3.1 Read the text

Residents of ancient Greece, Rome and Egypt did not know that they are "old". However, this did not prevent them to build decent roads. One of the oldest paved road in the history of mankind is considered to be a 12-kilometer line in Egypt, which was built for the transportation of basalt blocks to the Giza (out of these stones as a result and the famous pyramids were built). Impressive and the so-called Kings Highway in Persia, about which told Herodotus. According to him, it was a lovely paved track,

which was built king Darius I in the V century BC This road is not just linked to many cities of Persia. Thanks to her, Darius I managed to create the most advanced at that time the postal service.

This is what Herodotus wrote about it: "There is nothing in the world more quickly these messengers: the Persians so cleverly arranged the postal service! It is said that during the whole way they arranged the horses and people, so that each day of the journey has to a special horse and man. Neither snow, nor rain, nor heat, nor even a night's time can not prevent every rider gallop at full speed designated segment of the path. The first runner passes the news to the second and the third. And so the message goes from hand to hand until it reaches the target, like torches at the festival the Greeks in honor of Hephaestus. This horse mail Persians called "angareion". The brainchild of Darius I was very famous in the ancient world, and the words "royal road" is often used to refer to the easiest way to achieve the goal. Even Euclid once said Egyptian king Ptolemy, "the royal road to geometry no!".

And yet in the list of the world's greatest road we include another track, called Appian. This is the most important, most beautiful and most impressive of all the roads of ancient Rome. It was built in 312 BC when censor Apia Claudia Tseke and passed from Rome to Capua (later was carried to Brindisi). It is through this road carried Us mighty Rome to Greece, Egypt and Asia Minor. This track is impressive all the inhabitants of that time. This is not surprising. After all, it was almost all paved with hewn stones, the latter being laid on a multilayer pad, which consisted of flat stones, gravel and limestone layers, and a layer of sand, gravel and lime. The width of the road was great for those times - 4 meters. This allowed us to freely disperse two horse-drawn carriage, on the sides there were sidewalks and even ditches for drainage. And that road was the maximum level builders tore some hills, and buried lowlands.

The creation of this line (and in no other word) Appiah cost a huge sum - it went almost the entire treasury. But the result was appropriate. Appian Way became known as "the queen of roads", to live next to it was very prestigious, it began to appear along the

gorgeous monuments and tombs. And now the most interesting - the Appian Way still exists! In some areas of the track you can even drive a car.

5.4 Text 4 Bridges by Structure

http://www.historyofbridges.com/facts-about-bridges/types-of-bridges/

5.4.1 Read the text

- **Arch bridges** – These bridges uses arch as a main structural component (arch is always located below the bridge, never above it). They are made with one or more hinges, depending of what kind of load and stress forces they must endure. Examples of arch bridge are “Old Bridge” in Mostar, Bosnia and Herzegovina and The Hell Gate Bridge in New York.
- **Beam bridges** – Very basic type of bridges that are supported by several beams of various shapes and sizes. They can be inclined or V shaped. Example of beam bridge is Lake Pontchartrain Causeway in southern Louisiana.
- **Truss bridges** – Very popular bridge designs that uses diagonal mesh of posts above the bridge. The two most common designs are the king posts (two diagonal posts supported by single vertical post in the center) and queen posts (two diagonal posts, two vertical pots and horizontal post that connect two vertical posts at the top).
- **Cantilever bridges** – Similar in appearance to arch bridges, but they support their load not trough vertical bracing but trough diagonal bracing. They often use truss formation both below and above the bridge. Example of cantilever bridge is Queensboro Bridge in New York City.
- **Tied arch bridges** – Similar to arch bridges, but they transfer weight of the bridge and traffic load to the top chord that is connected to the bottom cords in bridge foundation. They are often called bowstring arches or bowstring bridges.

- **Suspension bridges** – Bridges that use ropes or cables from the vertical suspender to hold the weight of bridge deck and traffic. Example of suspension bridge is Golden Gate Bridge in San Francisco.
- **Cable-stayed bridges** – Bridge that uses deck cables that are directly connected to one or more vertical columns. Cables are usually connected to columns in two ways – harp design (each cable is attached to the different point of the column, creating harp like design of "strings" and fan design (all cables connect to one point at the top of the column).

Fixed or moveable bridges

- **Fixed** – Majority of bridges are fixed, with no moveable parts to provide higher clearance for river/sea transport that is flowing below them. They are designed to stay where they are made to the point they are deemed unusable or demolished.
- **Temporary bridges** – Bridges made from modular basic components that can be moved by medium or light machinery. They are usually used in military engineering or in circumstances when fixed bridges are repaired.
- **Moveable** – They have moveable decks, most often powered by electricity.

Types by use

- **Car Traffic** – The most common type of bridge, with two or more lanes designed to carry car and truck traffic of various intensities.
- **Pedestrian** – Usually made in urban environments, or in terrain where car transport is inaccessible (rough mountainous terrain, forests, etc.).
- **Double-decked** – Built to provide best possible flow of traffic across bodies of water or rough terrain. Most offen they have large amount of car lanes, and sometimes have dedicated area for train tracks.
- **Train bridges** – Bridges made specifically to carry one or multiple lane of train tracks.
- **Pipelines** – Bridges made to carry pipelines across water or inaccessible terrains. Pipelines can carry water, air, gas and communication cables.

- **Viaducts** – Ancient structures created to carry water from water rich areas to dry cities.
- **Commercial bridges** – Modern bridges that host commercial buildings such as restaurants and shops.

5.5 Text 5 Air conditioning

http://lingualeo.com/ru/

5.5.1 Read the text

Air conditioning and refrigeration are provided through the removal of heat. Heat can be removed through radiation, convection, and by heat pump systems through a process called the refrigeration cycle.

An air conditioning system, or a standalone air conditioner, provides cooling, ventilation, and humidity control for all or part of a house or building.

The refrigeration cycle uses four essential elements to create a cooling effect. The system refrigerant starts its cycle in a gaseous state. The compressor pumps the refrigerant gas up to a high pressure and temperature. From there it enters a heat exchanger (sometimes called a "condensing coil" or condenser) where it loses energy (heat) to the outside. In the process the refrigerant condenses into a liquid. The liquid refrigerant is returned indoors to another heat exchanger.

In variable climates, the system may include a reversing valve that automatically switches from heating in winter to cooling in summer. By reversing the flow of refrigerant, the heat pump refrigeration cycle is changed from cooling to heating or vice versa. This allows a residence or facility to be heated and cooled by a single piece of equipment, by the same means, and with the same hardware.

Central, 'all-air' air conditioning systems are often installed in modern residences, offices, and public buildings.

An alternative to central systems is the use of separate indoor and outdoor coils in split systems.

Air-conditioned buildings often have sealed windows, because open windows would work against an HVAC system intended to maintain constant indoor air conditions.

All modern air conditioning systems, down to small "window" package units, are equipped with internal air filters. These are generally of a lightweight gauzy material, and must be replaced as conditions warrant (some models may be washable). For example, a building in a high-dust environment, or a home with furry pets, will need to have the filters changed more often than buildings without these dirt loads. Failure to replace these filters as needed will contribute to a lower heat-exchange rate, resulting in wasted energy, shortened equipment life, and higher energy bills.

It is important to keep in mind that because an air conditioner moves heat between the indoor coil and the outdoor coil, both must be kept just as clean. This means that, in addition to replacing the air filter at the evaporator coil, it is also necessary to regularly clean the condenser coil. Failure to keep the condenser clean will eventually result in harm to the compressor.

Outside, "fresh" air is generally drawn into the system by a vent into the indoor heat exchanger section, creating positive air pressure. The percentage of return air made up of fresh air can usually be manipulated by adjusting the opening of this vent.

5.6 Text 6 Timber-frame construction – the binding tradition

5.6.1 Read the text

In the U.S. and Canada, with the exception of skyscrapers, the large majority of all new buildings are made of timber, including seven-floor city office buildings. The facades of these buildings are usually ornamented to simulate stone or concrete. Fire safety is provided by a system of fire safety devices, alarms, escape routes and sprinkler systems. The timber-frame style commonly used there, with one floor constructed after another, offers the advantage of being resistant to earthquakes. There are even

regulations in certain earthquake-prone regions that require the use of timber-frame construction.

Although some Native American tribes had a long tradition of timber architecture, the construction methods for log cabins and skeleton frame houses were brought to Canada and the United States by European carpenters and engineers. Modern architectural developments began with Walter Gropius, Konrad Wachsmann, Frank Lloyd Wright (prairie houses), Rudolf Schindler (Schindler frames) and later on with Charles Moore and the architects from his company, including Turnbull, Griffin and Haesloop, the latter receiving international recognition for the design of the “Sea Ranch” in California (1965). The immersion in space, time and the natural order of things was the driving force for these architects of modern, timber architecture, which featured simplicity in construction, detail and design.

5.7 Text 7 Heat Transfer

5.7.1 Read the text

When bodies of unequal temperatures are placed near each other, heat leaves the hotter body and is absorbed by the colder one until the temperatures are equal to each other. The rate by which the heat is absorbed by the colder body is proportional to the difference of temperature between the two bodies—the greater the difference in temperature, the greater the rate of flow of the heat.

Heat is transferred from one body to another at lower temperature by any one of the following means 1. Radiation 2. Conduction 3. Convection

Radiation, in so far as heat loss is concerned, refers to the throwing out of heat in rays. The heat rays proceed in straight lines, and the intensity of the heat radiated from any one source becomes less as the distance from the source increases.

The amount of heat loss from a body within a room or building through radiation depends upon the temperature of the floor, ceiling, and walls. The colder these surfaces are, the faster and greater will be the heat loss from a human body standing within the

enclosure. If the wall, ceiling, and floor surfaces are warmer than the human body within the enclosure they form, heat will be radiated from these surfaces to the body. In these situations a person may complain that the room is too hot.

Knowledge of the mean radiant temperature of the surfaces of an enclosure is important when dealing with heat loss by radiation. The mean radiant temperature (MRT) is the weighted average temperature of the floor, ceiling, and walls. The significance of the mean radiant temperature is determined when compared with the clothed body of an adult (80F, or 26.7C). If the MRT is below 80F, the human body will lose heat by radiation to the surfaces of the enclosure. If the MRT is higher than 80F, the opposite effect will occur.

Conduction is the transfer of heat through substances, for instance, from a boiler plate to another substance in contact with it. Conductivity may be defined as the relative value of a material, compared with a standard, in affording a passage through itself or over its surface for heat. A poor conductor is usually referred to as a nonconductor or insulator. Copper is an example of a good conductor. The various materials used to insulate buildings are poor conductors. It should be pointed out that any substance that is a good conductor of electricity is also a good conductor of heat.

Convection is the transfer of heat by the motion of the heated matter itself. Because motion is a required aspect of the definition of convection, it can take place only in liquids and gases.

5.8 Text 8 What is an Aluminum Composite Panel?

5.8.1 Read the text

An aluminum composite panel is a building material that features a foam core surrounded by an outer aluminum skin. These panels share many characteristics with wooden sandwich panels, but generally offer a higher strength-to-weight ratio. The core of these panels consists of an insulating foam, such as polyethylene or polystyrene, both of which are effective at reducing thermal transfer through walls. By combining

insulation and aluminum panels into a single material, manufacturers allow installers to quickly and easily construct walls and other building features.

Contractors may use an aluminum composite panel to construct the walls or ceiling of a home or commercial building. They may serve as the structure of the facility, or be used as cladding over traditional wood or steel framing. An aluminum composite panel may also be used as a source of insulation in a refrigeration system. These panels may form the walls of a large walk-in cooler, or may be used to line a traditional freezer or refrigeration unit. Finally, sign makers often use aluminum composite panels in place of heavy steel or other metals when building signs or billboards.

One of the factors that has contributed to the popularity of the aluminum composite panel is the wide variety of finish options these panels offer. Left unfinished, they provide the natural shine and beauty of aluminum. They can also be painted or covered with special metal coatings to add or reduce shine. Aluminum can also be embossed or texturized to resemble natural stone, or to add a design pattern of the user's choice. Finally, aluminum panels are fairly easy to bend and shape to create curves and other design features on a structure.

Beyond their appearance, aluminum composite panel products also offer a number of additional advantages to users. They are very lightweight, and require minimal structural support, yet are strong and durable. Compared to a wooden sandwich panel, the aluminum composite panel also offers a high degree of moisture resistance and fire resistance. Finally, these panels are fast and easy to install due to their light weight and flexibility.

One of the drawbacks to using aluminum composite panels is their susceptibility to dents or dings, particularly during storms or hurricanes. Some manufacturers may reinforce these panels with special threads to help resist damage. These panels also require careful attention to waterproofing, as lack of sufficient waterproofing may allow moisture to enter the seams around or above the panels.

5.9 Text 9 What Is Composite Construction?

5.9.1 Read the text

Composite construction is a method of construction that is used in a variety of engineering and building applications. Employing dissimilar components, such as concrete and steel or fiberglass and foam, for a single use or structure is called composite construction. The goal is the unification of the individual component properties to create a composite material that possesses the desired properties of all component pieces. Aircraft, watercraft and building construction are the three most common examples of industries that rely on these construction techniques.

When this form of construction is employed in the engineering and manufacturing process, it serves a few basic functions. Using composite materials, engineers and builders can create products that are stronger, more durable, lighter and lower in costs than traditional materials. Composite materials have made it possible for structural engineers and manufacturers to create products that would have been physically impossible with traditional construction materials.

Composite construction can enhance the strength of a single component, such as reinforced concrete that uses steel rebar to enhance the strength of the concrete. By pairing the concrete with the steel rebar, the original strength of the concrete is improved. This is because the rebar helps spread any impact or load exerted on the concrete evenly over a larger area.

The process of composite construction is also used to create composite materials that weigh less or are more durable than the individual components. This type of composite material is often used in the construction of aircraft and watercraft in which a lightweight foam is paired with a durable aluminum or hard plastic shell. A solid aluminum aircraft would be too heavy for sustained flight, and a foam aircraft would not be durable enough for continued use, but by pairing a thin aluminum skin with the foam, engineers can create a composite material that is both lightweight and durable.

In the process of making homes or other buildings, composite construction also comes into play. Composite materials used in homes and other buildings are often used for increased strength, durability, insulation or other factors. When paired with structural engineering techniques, composite materials and this type of construction can yield many advantages in the construction of homes and other buildings. Using composite construction to join individual components of a structure together, such as the floor panels to the joists, both component structures act together as one and have more strength than the individual components would have.

5.10 Text 10 Construction vehicles

5.10.1 Read the text

Heavy equipment refers to heavy-duty vehicles, specially designed for executing construction tasks, most frequently ones involving earthwork operations. They are also known as heavy machines, heavy trucks, construction equipment, engineering equipment, heavy vehicles, or heavy hydraulics. They usually comprise five equipment systems: implement, traction, structure, power train, control and information. Heavy equipment functions through the mechanical advantage of a simple machine, the ratio between input force applied and force exerted is multiplied. Some equipment uses hydraulic drives as a primary source of motion. From horses, through steam, to diesel.

Until the 19th century and into the early 20th century heavy machines were drawn under human or animal power. With the advent of portable steam-powered engines the drawn machine precursors were reconfigured with the new engines, such as the combine harvester. The design of a core tractor evolved around the new steam power source into a new machine core traction engine, that can be configured as the steam tractor and the steamroller. During the 20th century, internal-combustion engines became the major power source of heavy equipment. Kerosene and ethanol engines were used, but today diesel engines are dominant. Mechanical transmission was in many cases replaced by hydraulic machinery. The early 20th century also saw new electric-powered machines

such as the forklift. Caterpillar Inc. is a present-day brand from these days, starting out as the Holt Manufacturing Company. The first mass-produced heavy machine was the Fordson tractor in 1917.

The first commercial continuous track vehicle was the 1901 Lombard Steam Log Hauler. The use of tracks became popular for tanks during World War I, and later for civilian machinery like the bulldozer. The largest engineering vehicles and mobile land machines are bucket-wheel excavators, built since the 1920s.

"Until almost the twentieth century, one simple tool constituted the primary earthmoving machine: the hand shovel - moved with animal and human powered, sleds, barges, and wagons. This tool was the principal method by which material was either sidecast or elevated to load a conveyance, usually a wheelbarrow, or a cart or wagon drawn by a draft animal. In antiquity, an equivalent of the hand shovel or hoe and head basket—and masses of men—were used to move earth to build civil works. Builders have long used the inclined plane, levers, and pulleys to place solid building materials, but these labor-saving devices did not lend themselves to earthmoving, which required digging, raising, moving, and placing loose materials. The two elements required for mechanized earthmoving, then as now, were an independent power source and off-road mobility, neither of which could be provided by the technology of that time."

Container cranes were used from the 1950s and onwards, and made containerization possible.

Nowadays such is the importance of this machinery, some transport companies have developed specific equipment to transport heavy construction equipment to and from sites.

Table 1 The largest 10 construction equipment manufacturers in 2015

N	**Company**	**Country**	**CE Sales (million USD)**	**Share of total**
1	Caterpillar	United States	28,283	17.8 %

N	Company	Country	CE Sales (million USD)	Share of total
2	Komatsu	Japan	16,877	10.6 %
3	Hitachi Construction Machinery	Japan	7,790	4.9 %
4	Volvo Construction Equipment	Sweden	7,785	4.9 %
5	Terex	United States	7,390	4.6 %
6	Liebherr	Switzerland	7,129	4.5 %
7	John Deere	United States	6,581	4.1 %
8	XCMG	China	6,151	3.9 %
9	Sany	China	5,424	3.4 %
10	Doosan Infracore	South Korea	5,414	3.4 %

As a significant incorporated element of construction company, heavy gear suggests too much to the speed and quality of earthwork tasks, roadway construction and upkeep, loading and unloading businesses, also different projects. You may not understand these construction vehicles brands even though you see them plenty. So, today let’s get acquainted with these hottest construction devices. Or, you might be stumped as soon as your kids ask these names of building gear.

Dozer

Dozers tend to be certainly one of construction machines. For many people, perhaps the best-known dozers will be the scrape dozers additionally the bulldozers. This heavy earthwork machinery is installed with continuous treads and in the leading an earthmoving blade. This design is especially for going earth and slamming straight

down a building better. By the way, the blades are available in many types for different functions.

Loader

Following the debris, rubble, and dirt tend to be push apart by bulldozers, next it's time for front side loaders to come on stage to completely obvious the building web sites. Due to the design of a front scoop or shovel, forward loaders are good at uploading soil, sand, lime, coal also bulk products into dump vehicles or any other vehicles. Occasionally, they can be regularly moderately dig and scoop the ore, hardpan, and stuff like that. But they're not ideal to carry out items that are below the floor.

Dump vehicle

This is actually a truck with an open-box sleep, makes it possible for the dust, gravel, or sand becoming instantly deposited on the ground. It primarily consist of automobile framework, hydraulic lifting process, sleep, and an electric take-off or energy takeoff (PTO). In civil manufacturing a tipper truck usually joins excavators, loaders, conveyor as well as other building machinery to upload, haul away, and unload soil, gravel, as well as other bulk-material in building sites.

Excavators

Excavators or backhoes use their particular shovel to dig the materials above or underneath the ground level after which scoop and publish all of them in to the transport car. The primary areas of these devices consist of household, container, stick, and a boom. Just what an excavator mainly handles entail dirt, coal, sand, and loose stone. In recent years, excavators have grown to be probably one of the most important construction machinery. In addition, the 3 main parameters about excavators tend to be running weight (mass), motor energy, and bucket capacity.

Crane

Cranes are a type of machinery that vertically lifts and horizontally carries heavy loads within a particular range. A crane is described as an intermittent work period. That’s to state, the matching procedure of taking, moving, unloading, also actions works

alternatively in a-work pattern. According to the specific situation of this jobs, you can find tower crane, crawler crane, harsh landscapes crane, tracked crane, and truck-mounted crane open to be plumped for from. Plus in the truth of tower crane, generally the cab operator needs to operate it based on infrared indicators, especially in high-rise buildings that are under construction.

Processor chip spreader

This is certainly a type of roadwork machinery that may be propelled by itself. Processor chip spreader is especially created for surface therapy. In other words, it penetrates area voids and pre-coats the road base. Besides, it provides maintenance too. Evidently, a layer of stone chippings is key toward toughness and quality of the road. Therefore, the significance of the apparatus that does this job, specifically processor chip spreader, is self-explanatory.

Asphalt finisher

This will be roadwork machinery that is made of lorry, tractor, and screed. It really is primarily made to put asphalt cement, which can be included into the paver's hopper from a material transfer device like a dump truck. In addition, before a road roller it somewhat compacts the asphalt flat too.

Compactor

Regarding construction sites, a compactor is designed to use pressure on earth and cause a lot of deformation into object. In other words, it lowers the quantity of items. Compactors usually are powered by hydraulics. To cater for various circumstances, this construction gear comes in various shapes and sizes also.

5.11 Text 11 The Tallest Buildings in the World

5.11.1 Read the text

by Jackie Craven

Updated October 24, 2017

Tall buildings are everywhere. Since it opened in 2010, the Burj Khalifa in Dubai, United Arab Emirates, has been considered the tallest building in the world, BUT...

Skyscrapers are being built all around the world. The measured height of new skyscrapers seems to rise every year. Other Supertall and Megatall buildings are on the drawing board. Today the tallest building is in Dubai, but soon the Burj may be second tallest or third or further down the list.

What is the tallest building in the world? It depends on who does the measuring and when it's built. Skyscraper buffs disagree on whether features like flagpoles, antennae, and spires should be included when measuring building height. Also under dispute is the question of what, exactly, is the definition of a building. Technically, observation towers and communications towers are considered "structures," not buildings, because they are not habitable. They do not have residential or office space.

Here are the contenders:

1. The Burj Dubai

It opened on January 4, 2010, and at a soaring 828 meters (2,717 feet), the Burj Dubai in the United Arab Emirates is now considered the world's tallest building. Keep in mind, however, that these statistics include the skyscraper's enormous spire.

2. Shanghai Tower

When it opened in 2015, the Shanghai Tower wasn't even close to the height of Burj Dubai, but it readily slipped into place as the second tallest building in the world at 632 meters (2,073 feet).

3. Makkah Clock Royal Tower Hotel

The city of Mecca in Saudi Arabia jumped on the skyscraper bandwagon with the 2012 completion of the Fairmont Hotel in the Abraj Al Bait Complex. At 601 meters (1,972 feet), this towering multi-use building is considered the second tallest in the world. The 40 meters (130 feet) four-faced clock atop the tower announces daily prayers and can be seen 10 miles away from this holy city.

4. Ping An Finance Center

Completed in 2017, PAFC is yet another skyscraper to be built in Shenzhen, China — China’s first Special Economic Zone. Since 1980, the population of this once-rural community has increased by millions of people, millions of dollars, and millions of square feet of vertical space. At 599 meters high (1,965 feet), it's roughly the same height as the Makkah Clock Royal.

5. Lotte World Tower

Like PAFC, the Lotte was also completed in 2017 and also designed by Kohn Pedersen Fox Associates. It will be in the top 10 highest buildings for a while, at 554.5 meters (1,819 feet). Located in Seoul, Lotte World Tower is the tallest building in South Korea and third tallest in all of Asia.

6. One World Trade Center

For a while it was thought that the 2002 plan for Freedom Tower in Lower Manhattan easily would become the world's tallest building. But security concerns lead designers to scale down their plans. The design of One World Trade Center changed between 2002 and when it opened in 2014. Today it rises 541 meters (1,776 feet), but much of that height is in its needle-like spire.

The occupied height is a mere 386.6 meters (1,268 feet) — Willis Tower in Chicago and the IFC in Hong Kong are taller when measured in occupied height.

Yet, in 2013 the design architect, David Childs, argued that the 1WTC spire was a "permanent architectural feature," whose height should be included. The Council on Tall Buildings and Urban Habitat (CTBUH) agreed and ruled that 1WTC would be the third tallest building in the world when it opened in November 2014. Although 1WTC may be New York's tallest building for a long time, it already has slipped in global ranking — but so will most of today's completed skyscrapers.

7. Guangzhou CTF Finance Centre

Another Kohn Pedersen Fox-designed Chinese skyscraper, the Chow Thai Fook Finance Centre in the port city of Guangzhou rises 530 meters (1,739 feet) above the

Pearl River. Completed in 2016, it is the third tallest skyscraper in China, a country gone wild with building tall in the 21st century.

8. The Taipei 101 Tower

Measuring 508 meters (1,667 feet) tall, the Taipei 101 Tower in Taipei, Taiwan was widely considered the world's tallest building when it opened back in 2004. But, like the Burj Dubai, the Taipei 101 Tower gets much of its height from a huge spire.

9. Shanghai World Financial Centre

Yes, this is the skyscraper that looks like a giant bottle opener. The Shanghai Financial Centre still turns heads, but not only because it's more than 1,600 feet high. It's been in the top 10 list of world's tallest buildings since it opened in 2008.

10. International Commerce Centre (ICC)

By 2017, five of the top 10 tallest buildings were in China. The ICC Building, like most of the new skyscrapers on this list, is a multi-use structure that includes hotel space. Built between 2002 and 2010, the Hong Kong building at 484 meters (1,588 feet) high will surely slip from the world's top 10 list, but the hotel will still provide great views!

More From the Top 100

Petronas Twin Towers: At one time the Petronas Twin Towers in Kuala Lumpur, Malaysia were described as the tallest buildings in the world at 452 meters (1,483 feet). Today they don't even make the top 10 list. Once again, we should look upward — Cesar Pelli's Petronas Towers get much of their height from spires and not from usable space.

Willis Tower: If you count only habitable space and measure from the sidewalk level of the main entrance to the structural top of the building (excluding flagpoles and spires), then Chicago's Sears Tower ("Willis Tower"), built in 1974, still ranks among the tallest buildings in the world.

Wilshire Grand Center: Up until now, New York City and Chicago have been the two cities to dominate skyscraper height in the U.S. Not anymore. In 2014, the City of

Los Angeles changed an old 1974 local rule that mandated rooftop landing pads for emergency helicopters. Now, with a new fire code and construction methods and materials that mitigate earthquake damage, Los Angeles is looking up. The first to rise is the Wilshire Grand Center in 2017. At 335.3 meters (1,100 feet), it's on the list of top 100 world's tallest buildings, but L.A. should be able to get higher than that.

Future Contenders

Jeddah Tower: In ranking the tallest, do you count buildings that are still being built? Kingdom Tower, also known as Jeddah Tower under construction in Saudi Arabia, is designed to have 167 floors above ground — at a whopping 1000 meters (3,281 feet) high, Kingdom Tower will be more than 500 feet higher than the Burj Khalifa and more than 1500 feet higher than 1WTC. The list of 100 future tallest buildings in the world points to 1WTC not even being in the top 20 in a matter of years.

Tokyo Sky Tree: Supposing we included spires, flagpoles, and antennae when measuring building heights. In that case, it might not make sense to distinguish between buildings and towers when ranking building heights. If we rank all man-made structures, whether or not they contain habitable space, then we'd have to give high rankings to the Tokyo Sky Tree in Japan, measuring 634 meters (2,080 feet). Next in running is China's Canton Tower, which measures 604 meters (1,982 feet).

Finally, there's the old 1976 CN Tower in Toronto, Canada. Measuring 553 meters (1,815 feet) tall, the iconic CN Tower was the world's tallest for many years.

Kuwait building the world's tallest tower at 1,001 meters

Kuwait is building the world's tallest tower at 1,001 meters in Madinat al Hareer, also known as the City of Silk. When completed, the Burj Mubarak al-Kabir will beat a residential tower undergoing construction in Dubai estimated to rise between 700 to 800 meters. The Kuwait Municipal Council approved Wednesday the development plans of Madinat Al Hareer, a multi-purpose economic, commercial and residential development in Subiyah. It is owned by Madinat Al Hareer Corporation, a government firm. Covering 250 square kilometers, it will include the world tallest structure, a 2-sq. km. natural

desert reservation, duty free area, a new airport, tourist-oriented establishments and business centers. It is estimated to cost $86.1 billion (25 billion dinar). The project aims to reduce Kuwait's dependence on revenues from oil. Half of Kuwait's gross domestic product, valued at $60.72 billion in 2006, came from petroleum. The country holds 10 percent of the world's oil reserves. Dubai's standing tallest structure is Burj Dubai at 422.5 meters with 120 storeys. It is one of five completed building in the world with more than 100 floors. Next to Burj Dubai are New York's Empire State building measuring 381 meters and Chicago's John Hancock Centre with 344 meters.

5.12 Text 12 Building Construction

5.12.1 Read the text

The Europeans who established the North American colonies in the seventeenth century brought their knowledge of materials and techniques from their native lands, but during the first few years of settlement they were often compelled to adopt Indian techniques. The English, Dutch, German, and French who settled the seaboard and Gulf coast areas brought variations on framing in sawn timbers. Frames were usually covered with clapboard siding for walls and shingles for roofs—the latter gradually giving way to slate and tile in the more elegant houses, especially those built by the Dutch. Construction in thick wooden planks set vertically came to be common in parts of the Connecticut Valley, while construction of solid walls built up of horizontally laid logs was introduced by Swedish settlers in the Delaware Valley. The only stone in these early structures was confined to foundations and chimneys. Joints were originally the mortise-and-tenon form secured by wooden pegs, but handwrought nails began to be used early in the seventeenth century and machine-made varieties in the late eighteenth century.

In the more costly forms of buildings, brick laid up in lime mortar slowly replaced timber construction in the English-speaking areas, but expensive stone masonry was confined largely to the Dutch settlements of the New York area. The domed and vaulted construction of eighteenth-century mission churches required kiln-baked, stucco-covered

brick, which was stronger and more manageable than the adobe brick, widely used in the Spanish Southwest. All of the traditional European building materials were used throughout the nineteenth century, although with some innovation. Heavy power-sawed timbers were used as posts, sills, girders, rafters, joists, and braces in buildings and truss bridges; deep laminated timbers of bolted planks were developed early in the nineteenth century for the arch ribs of bridges; thinner lumber, like the two-by-four, which was soon to become universal, became the basis of the light balloon frame invented in 1833. As the nation expanded, carefully dressed masonry work of both stone and brick began to appear in large and elegant forms.

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