ФЕДЕРАЛЬНОЕ АГЕНТСТВО ПО ОБРАЗОВАНИЮ

КАЗАНСКИЙ ГОСУДАРСТВЕННЫЙ

АРХИТЕКТУРНО-СТРОИТЕЛЬНЫЙ УНИВЕРСИТЕТ

Кафедра иностранных языков

Concrete

Методические указания для студентов вторых курсов дневного отделения неязыковых вузов по развитию умения читать оригинальную литературу.

Казань

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Цель методических указаний – развитие умения читать оригинальную литературу, опираясь на изученный языковой материал, точно и адекватно извлекать основную информацию, содержащуюся в тексте, формирование речевых навыков в сфере профессиональной коммуникации.

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Concrete

1) **Прочитайте заглавие текста и расскажите о чем пойдет речь.**
2) **Запомните слова необходимые для работы над текстом;**

♦concrete- бетон ; бетонировать
♦cement – цемент
♦Portland cement- портландцемент
♦crushed -дроблёный; размельчённый
♦cementitious- цементирующий
♦harden -закаливать; цементировать; твердеть, набирать прочность (о бетоне)
♦according- to согласно
♦cementitious materials – вяжущие
♦solidify- делать твёрдым ; затвердевать
♦fly ash -зольная пыль, летучая зола
♦slag cement - бесклинкерный шлаковый цемент
♦fine aggregate - мелкий заполнитель
♦hydration –гидратация
♦pebble - галька, булыжник
♦architectural structure- архитектурное сооружение
♦ footing - опора
♦ binding agent- связующее вещество
♦ pavements -1) мостовая; дорожное покрытие
♦man-made material – материал созданный руками человека
♦mud - глинистый раствор; буровой раствор
♦straw- солома
♦oundations- искусственное основание; фундамент;
♦widespread - широко распространённый
♦ quicklime - негашёная известь
♦ widespread - широко распространённый
♦ roman aqueducts - акведук (мост с лотком, трубопроводом, по которому вода переводится через овраги, ущелья, дороги)
♦longevity- долговечность
♦to crack- трещать

3) **Прочитайте и переведите текст:**

Concrete is a construction material composed of cement (commonly Portland cement) as well as other cementitious materials such as fly ash and slag cement, aggregate (generally a coarse aggregate such as gravel, limestone, or granite, plus a fine aggregate such as sand), water, and chemical admixtures. The word concrete comes from the Latin word "concretus", which means "hardened" or "hard".

Concrete solidifies and hardens after mixing with water and placement due to a chemical process known as hydration. The water reacts with the cement, which bonds the other components together, eventually creating a stone-like material. Concrete is used to make pavements, architectural structures, foundations, motorways/roads, bridges/overpasses, parking structures, brick/block walls and footings for gates, fences and poles.

More concrete is used than any other man-made material in the world. As of 2006, about 7 cubic kilometres of concrete are made each year—more than one cubic metre for every person on Earth. Concrete powers a $US 35-billion industry which employs more than two million workers in the United States alone. More than 55,000 miles (89,000 km) of highways in America are paved with this material. The People's Republic of China currently consumes 40% of the world's cement/concrete production.
Many ancient civilizations used forms of concrete using dried mud, straw, and other materials.

During the Roman Empire, Roman concrete was made from quicklime, pozzolanic ash/pozzolana, and an aggregate of pumice; it was very similar to modern Portland cement concrete. The widespread use of concrete in many Roman structures has ensured that many survive almost intact to the present day. The Baths of Caracalla in Rome are just one example of the longevity of concrete, which allowed the Romans to build this and similar structures across the Roman Empire. Many Roman aqueducts have masonry cladding to a concrete core, a technique they used in structures such as the Pantheon, Rome, the interior dome of which is unclad concrete.

The secret of concrete was lost for 13 centuries until 1756, when the British engineer John Smeaton pioneered the use of hydraulic lime in concrete, using pebbles and powdered brick as aggregate. Portland cement was first used in concrete in the early 1840s.

Recently, the use of recycled materials as concrete ingredients is gaining popularity because of increasingly stringent environmental legislation. The most conspicuous of these is fly ash, a by-product of coal-fired power plants. This has a significant impact by reducing the amount of quarrying and landfill space required, and, as it acts as a cement replacement, reduces the amount of cement required to produce a solid concrete. As cement production creates massive quantities of carbon dioxide, cement-replacement technology such as this will play an important role in future attempts to cut carbon dioxide emissions.

Concrete additives have been used since Roman and Egyptian times, when it was discovered that adding volcanic ash to the mix allowed it to set under water. Similarly, the Romans knew that adding horse hair made concrete less liable to crack while it hardened, and adding blood made it more frost-resistant. In modern times, researchers have experimented with the addition of other materials to create concrete with improved properties, such as higher strength or electrical conductivity.

4) Прочитайте текст и найдите ответы на следующие вопросы:

What is the history of concrete?

- What are the main components of concrete?
- How was concrete maid by Romans?
- When was the secret of concrete lost?
- What kinds of materials are gaining popularity?
- What did the Romans add for making concrete?
- What have researchers experimented with?

5) **Прочтите текст и скажите, соответствуют ли следующие утверждения содержанию текста**?

- Concrete is a construction material composed of timber.
- The water reacts with the stone and ash.
- The secret of concrete was lost for 13 centuries until 1756
- Concrete is used to make furniture.
- Recently, the use of recycled materials as concrete ingredients is gaining popularity because of increasingly stringent environmental legislation.
- Concrete additives have been used since Roman and Egyptian times, when it was discovered that adding volcanic ash to the mix allowed it to set under water.
- The People's Republic of China currently makes 40% of the world's cement/ concrete production.
- Many Roman aqueducts have masonry cladding to iron.
- During the Roman Empire, Roman concrete was made from quicklime, pozzolanic ash/pozzolana, and an aggregate of pumice.

6)Составьте план текста.

7) Прочитайте текст еще и составьте вопросы .

8) Составьте реферат, используя следующие выражения:

- The title of the text is …
- The text concerns the problem(information, data) …
- The main idea of the text is …
- I'd like to underline (stress) that …
- In conclusion I'd like to pay your attention to the fact that …
- Thus, we may include that …

10) Письменно переведите текст со словарем (30 мин)

Concrete composition

1) Прочитайте заглавие текста и расскажите о чем пойдет речь.

2) Запомните слова необходимые для работы над текстом;

♦ concrete composition - состав бетонной смеси
♦ to depend on -зависеть от
♦in general usage - общеупотребительный
♦plaster- штукатурка, штукатурный раствор (для внутренних работ)
♦mortar- строительный раствор; известковый раствор
♦portland limestone- портландский известняк
♦calcium- кальций
♦limestone - известняк
♦silicon- кремний; силиций
♦clay - глина
♦grinding - помол
♦a cement paste - цементное тесто
♦glue - вяжущий материал
♦aluminum- алюминий
♦sulfate- сульфат
♦bottom ash - шлак, зольный остаток
♦slump- оползень
♦powder - порошок
♦crushed glass – стеклобой
♦impure water - загрязнённая вода
♦batching - дозирование
♦accelerator – ускоритель
♦plasticizer - пластифицирующая добавка
♦ pigments - пигмент, краситель
♦corrosion inhibitors - ингибитор коррозии
♦bonding agents - скрепляющее вещество; склеивающее вещество
♦pumping aid - подача элементов насосом
♦ rapidly - быстро
♦ interlocking crystals- блокирование
♦workability - способность (материала) подвергаться обработке
♦curing process- процесс затвердевания

3) Прочитайте и переведите текст:

The mix design depends on the type of structure being built, how the concrete will be mixed and delivered, and how it will be placed to form this structure.

Cement.

Portland cement is the most common type of cement in general usage. It is a basic ingredient of concrete, mortar, and plaster. English engineer Joseph Aspdin patented Portland cement in 1824; it was named because of its similarity in colour to Portland limestone, quarried from the English Isle of Portland and used extensively in London architecture. It consists of a mixture of oxides of calcium, silicon and aluminium. Portland cement and similar materials are made by heating limestone (a source of calcium) with clay, and grinding this product (called clinker) with a source of sulfate (most commonly gypsum).

Water.

Combining water with a cementitious material forms a cement paste by the process of hydration. The cement paste glues the aggregate together, fills voids within it, and allows it to flow more easily.

Less water in the cement paste will yield a stronger, more durable concrete; more water will give an easier-flowing concrete with a higher slump.

Impure water used to make concrete can cause problems, when setting, or in causing premature failure of the structure.

Hydration involves many different reactions, often occurring at the same time. As the reactions proceed, the products of the cement hydration process gradually bond together the individual sand and gravel particles, and other components of the concrete, to form a solid mass.

Fine and coarse aggregates make up the bulk of a concrete mixture. Sand, natural gravel and crushed stone are mainly used for this purpose. Recycled aggregates (from construction, demolition and excavation waste) are increasingly used as partial replacements of natural aggregates, while a number of manufactured aggregates, including air-cooled blast furnace slag and bottom ash are also permitted.

Decorative stones such as quartzite, small river stones or crushed glass are sometimes added to the surface of concrete for a decorative "exposed aggregate" finish, popular among landscape designers.

Chemical admixtures.

Chemical admixtures are materials in the form of powder or fluids that are added to the concrete to give it certain characteristics not obtainable with plain concrete mixes. In normal use, admixture dosages are less than 5% by mass of cement, and are added to the concrete at the time of batching/mixing. The most common types of admixtures are:

a. Accelerators speed up the hydration (hardening) of the concrete.
b. Retarders slow the hydration of concrete, and are used in large or difficult pours where partial setting before the pour is complete is undesirable.

c. Air-entertainers add and distribute tiny air bubbles in the concrete, which will reduce damage during freeze-thaw cycles thereby increasing the concrete's durability. However, entrained air is a trade-off with strength, as each 1% of air may result in 5% decrease in compressive strength.
d. Plasticizers (water-reducing admixtures) increase the workability of plastic or "fresh" concrete, allowing it be placed more easily, with less consolidating effort. Superplasticizers (high-range water-reducing admixtures) are a class of plasticizers which have fewer deleterious effects when used to significantly increase workability. Alternatively, plasticizers can be used to reduce the water content of a concrete (and have been called *water reducers* due to this application) while maintaining workability. This improves its strength and durability characteristics.
e. Pigments can be used to change the color of concrete, for aesthetics.
f. Corrosion inhibitors are used to minimize the corrosion of steel and steel bars in concrete.
g. Bonding agents are used to create a bond between old and new concrete.
h. Pumping aids improve pumpability, thicken the paste, and reduce dewatering – the tendency for the water to separate out of the paste.

Concrete Production

The processes used vary dramatically, from hand tools to heavy industry, but result in the concrete being placed where it cures into a final form. When initially mixed together, Portland cement and water rapidly form a gel, formed of tangled chains of interlocking crystals. These continue to react over time, with the initially fluid gel often aiding in placement by improving workability. As the concrete sets, the chains of crystals join up, and form a rigid structure, gluing the aggregate particles in place. During curing, more of the cement reacts with the residual water (Hydration). This curing process develops physical and chemical properties. Among other qualities, mechanical strength, low moisture permeability, and chemical and volumetric stability.

3) Прочитайте следующий текст и дайте название:

Fine and coarse aggregates make up the bulk of a concrete mixture. Sand, natural gravel and crushed stone are mainly used for this purpose. Recycled aggregates (from construction, demolition and excavation waste) are increasingly used as partial replacements of natural aggregates, while a number of manufactured aggregates, including air-cooled blast furnace slag and bottom ash are also permitted.

Decorative stones such as quartzite, small river stones or crushed glass are sometimes added to the surface of concrete for a decorative "exposed aggregate" finish, popular among landscape designers.

4) Прочтите текст и дайте ответы на следующие вопросы:

- What type of cement is the most common?
- Who patented Portland cement?
- What does the process of hydration mean?
- What does impure water do?
- What does the cement paste glue?
- What reaction does Hydration involve?
- How is concrete made?
- Does the whole mixture set and harden when hydration takes place?
- A solid mass is formed, right?
- Do you know what is termed “aggregate”?

5) Прочтите текст и скажите, соответствуют ли следующие утверждения содержанию текста.

- Portland cement is the most common type of cement in general usage.
- Portland limestone used extensively in U.S.A. architecture?
- Less water in the cement paste will yield a weaker concrete.
- The products of the cement hydration process gradually decompose the individual sand and gravel particles.
- Chemical admixtures are materials in the form of powder or fluids that are added to the concrete to give it certain characteristics not obtainable with plain concrete mixes.
- Accelerators minimize the hydration (hardening) of the concrete.
- Pigments can be used to change the volume of concrete.

6) Составьте план текста.

7) Составьте вопросы, которые помогли бы вам сделать пересказ текста.

8) Переведите следующие предложения на английский язык:

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

9) Составьте реферат, используя следующие выражения:

1) The title of the text is …
2) The text concerns the problem(information, data) …

3) The main idea of the text is …
4) I'd like to underline (stress) that …
5) In conclusion I'd like to pay your attention to the fact that …
6) Thus, we may include that …

11) Письменно переведите текст со словарем (30 мин)

Mixing Concrete

1) Прочитайте заглавие текста и расскажите о чем пойдет речь.

2) Запомните слова, необходимые для работы над текстом;

♦ thorough - тщательный, детальный
♦ a production – выработка
♦ slump - внезапное падение
♦ equipment -оборудование
♦ to produce - вырабатывать
♦ mixing - перемешивание, смешивание
♦ high-speed- высокоскоростной
♦ premixed paste предварительно смешанный цементное тесто
♦ to blend смешивать; изготовлять смесь; смесь
♦ high-speed mixing- скоростное смешивание
♦ by means of - посредством
♦ lightweight concrete
♦ in ordinary - постоянный
♦ a plasticizer- пластифицирующая добавка
♦ drastically решительно
♦ in conventional -обычный, стандартный
♦ firmly- крепко,
♦ to shrink- уменьшать, сокращать
♦ binder- связующее (вещество)

3) Прочитайте и переведите текст:

Thorough mixing is essential for the production of uniform, high quality concrete. Therefore, equipment and methods should be capable of effectively mixing concrete materials containing the largest specified aggregate to produce uniform mixtures of the lowest slump practical for the work. Separate paste mixing has shown that the mixing of cement and water into a paste before combining these materials with aggregates can increase the compressive strength of the resulting

concrete. The paste is generally mixed in a high-speed, shear-type mixer at a w/cm (water to cement ratio) of 0.30 to 0.45 by mass. The premixed paste is then blended with aggregates and any remaining batch water, and final mixing is completed in conventional concrete mixing equipment. High-Energy Mixed Concrete (HEM concrete) is produced by means of high-speed mixing of cement, water and sand with net specific energy consumption at least 5 kilojoules per kilogram of the mix. It is then added to a plasticizer admixture and mixed after that with aggregates in conventional concrete mixer. This paste can be used itself or foamed (expanded) for lightweight concrete. Sand effectively dissipates energy in this mixing process. HEM concrete fast hardens in ordinary and low temperature conditions, and possesses increased volume of gel, drastically reducing capillarity in solid and porous materials. It is recommended for precast concrete in order to reduce quantity of cement, as well as concrete roof and siding tiles, paving stones and lightweight concrete block production.The ratio of cement to aggregate is decisive for strength and fabrication costs of the concrete. With an excessive portion of cement, concrete tends to shrink, which may entail the formation of cracks; besides, the fabrication costs will unnecessarily be increased. If, on the other hand, the portion of cement added is too small, not all particles of the aggregate will be firmly cemented together. This results in a less dense concrete, which will tend to give off sand. The ratio of cement to aggregate of 1:4 in parts by volume indicates that four cartfuls of aggregate are to be added to each cartful of cement. The ratio of cement to aggregate of 1:4 in parts by weight indicates that 4 kg of aggregate must be added per each kg of cement added to the mixture. The ratio of cement to aggregate 300 kg of cement to one m^3 of concrete indicates that 300 kg of cement must be used for the fabrication of each cubic metre of hardened concrete. The amount of water added influences not only the strength but also the consistency (working stiffness) of the concrete. According to consistency, we distinguish between stiff (no-slump or “dry” concrete), soft (plastic), and chuted concrete. The smallest amount of binder is required for the fabrication of stiff concrete. This type of concrete reaches a strength which is almost double the strength of plastic concrete although the portion of cement added is equal in both cases. Plastic and chuted types of concrete, which contain more water, are, therefore, only used when their application is justified by special conditions, for example concrete with close-meshed reinforcement.

The amount of cement in kg required per cubic metre of ready-made concrete (non-reinforced concrete) is as follows:

Lean-mixed concrete	100 kg/ m^3
Plain foundations	125 to 150 kg/ m^3
Top concrete	150 to 180 kg/ m^3
Highly stressed exposed concrete for faces	200 kg/ m^3
Sub-concrete for roads	250 to 330 kg/ m^3
Pavement concrete	300 to 350 kg/ m^3
Floor topping concrete	500 kg/ m^3

4) Прочтите текст и дайте ответы на следующие вопросы:

- What does the mixing mean?
- Thorough mixing is essential for the production of uniform, high quality concrete, isn't it?
- What can increase the compressive strength of the resulting concrete?
- How is HEM concrete produced?
- Does sand or clay dissipate energy in the mixing process?
- HEM concrete fast hardens in ordinary, doesn't it?
- What is recommended for precast concrete?
- What types of concrete do you know?

5) Прочтите текст и скажите, соответствуют ли следующие утверждения содержанию текста?

1) Plastic and chuted types of concrete, which contain more water, are, therefore, only used when their application is justified by special conditions, for example concrete with close-meshed reinforcement.
2) The ratio of cement to aggregate is decisive for strength and fabrication costs of the concrete.
3) The premixed paste is then blended with aggregates and any remaining batch water, and final mixing is completed in conventional concrete mixing equipment.
4) According to consistency, we distinguish between hard and weak cement.
5) The biggest amount of binder is required for the fabrication of stiff concrete.

6) Прочитайте текст еще раз и составьте вопросы к интересующей вас информации.

7) Составьте план текста.

8) Составьте вопросы, которые помогли бы вам сделать пересказ текста.

9) Составьте реферат, используя следующие выражения:

- The title of the text is …
- The text concerns the problem(information, data) …
- The main idea of the text is …
- I'd like to underline (stress) that …
- In conclusion I'd like to pay your attention to the fact that …
- Thus, we may include that …

10) Письменно переведите текст со словарем (30 мин)

Workability

1) Прочитайте заглавие текста и расскажите о чем пойдет речь.

2) Запомните слова, необходимые для работы над текстом;

♦ workability - способность (материала) подвергаться обработке;
♦обрабатываемость; удобообрабатываемость
♦ concrete mix- смесь
♦ fresh concrete- свежеуложенная бетонная смесь
♦ water content- содержание воды
♦modify- видоизменять, трансформировать
♦ chemical admixtures –химические добавки
♦gravity - сила тяжести
♦ concrete workability - удобообрабатываемость бетонной смеси
♦to observe- наблюдать
♦ segregation- расслоение
♦ batch -замес; дозировка
♦ harsh – жёсткий
♦ cone - конус
♦ reasonable – умеренный
♦ non-absorptive surface- непоглощающая поверхность
♦to tamp- трамбовать
♦ consolidate - затвердевать, твердеть, уплотняться
♦ wet concrete- пластичная бетонная смесь
♦ jobsite- строительная площадка
♦ internal water – водоподготовка

3) Прочитайте и переведите текст:

Workability is the ability of a fresh (plastic) concrete mix to fill the form/mold properly with the desired work (vibration) and without reducing the concrete's quality.
Workability depends on water content, aggregate (shape and size distribution), cementitious content and age (level of hydration), and can be modified by adding chemical admixtures. Raising the water content or adding chemical admixtures will increase concrete workability. Excessive water will lead to increased bleeding (surface water) and/or segregation of aggregates (when the cement and aggregates start to separate), with the resulting concrete having reduced quality. The use of an aggregate with an undesirable gradation can result in a very harsh mix design with

a very low slump, which cannot be readily made more workable by addition of reasonable amounts of water.

Workability can be measured by the Concrete Slump Test, a simplistic measure of the plasticity of a fresh batch of concrete following the ASTM C 143 or EN 12350-2 test standards. Slump is normally measured by filling an "Abrams cone" with a sample from a fresh batch of concrete. The cone is placed with the wide end down onto a level, non-absorptive surface. It is then filled in three layers of equal volume, with each layer being tamped with a steel rod in order to consolidate the layer. When the cone is carefully lifted off, the enclosed material will slump a certain amount due to gravity. A relatively dry sample will slump very little, having a slump value of one or two inches (25 or 50 mm). A relatively wet concrete sample may slump as much as six or seven inches (150 to 175 mm). Slump can be increased by adding chemical admixtures such as mid-range or high-range water reducing agents (super-plasticizers) without changing the water/cement ratio. It is bad practice to add excessive water upon delivery to the jobsite; however in a properly designed mixture it is important to reasonably achieve the specified slump prior to placement as design factors such as air content, internal water for hydration/strength gain, etc. are dependent on placement at design slump values. High-flow concrete, like self-consolidating concrete, is tested by other flow-measuring methods. One of these methods includes placing the cone on the narrow end and observing how the mix flows through the cone while it is gradually lifted.

4) Прочтите текст и дайте ответы на следующие вопросы:

1) What does “workability” mean?
2) What does workability depend on?
3) Will raising sand or adding chemical admixtures increase concrete workability?
4) Excessive water will lead to increased bleeding (surface water) and/or segregation of aggregates, will not it?

5) Составьте план текста.

6) Прочитайте текст и дайте ему название:

Concrete is the most common building material for modern construction practice, It consists of cement used as binding agent and aggregate for example crushed stone and sand. These components are mixed with water. The cement is hardening and thus making the particles of the aggregate adhere close to each other. Fixed limiting means, in most cases formwork are used to shape the building unit according to plan. The concrete is filled into the formwork immediately after mixing and is then compacted. The form work can be removed as soon as the concrete has become hard enough. Concrete is suitable for various applications in building because different properties can be imparted to it by an appropriate selection and composition of the basic materials and by using special admixtures

and methods of fabrication. The properties of building material which are most important to construction practice are: compressive strength; bending and buckling strength; resistance wear the effects of water weathering and the like; resistance to the attack of small animals; thermal insulation capacity; and volume stability.

7) Замените слова в скобках английскими эквивалентами:

(Способность (материала) подвергаться обработке)can be measured by the Concrete Slump Test, a simplistic measure of the plasticity of a fresh batch of concrete following the ASTM C 143 or EN 12350-2 (испытательные нормы). (Осадка конуса) is normally measured by filling an "Abrams cone" with a образец from a fresh (замес; дозировка) of concrete. The cone is placed with the wide end down onto a level, (непоглощающая) surface. It is then filled in three (слоя) of equal volume, with each layer being tamped with a steel rod in order to consolidate the layer. When the cone is carefully (поднимают), the enclosed material will slump a certain amount due to gravity. (Сравнительно) dry sample will slump very little, having a slump value of one or two inches (25 or 50 mm).

8) Составьте вопросы, которые помогли бы вам сделать пересказ текста.

9) Составьте реферат, используя следующие выражения:

1) The title of the text is …
2) The text concerns the problem (information, data) …
3) The main idea of the text is …
4) I'd like to underline (stress) that …
5) In conclusion I'd like to pay your attention to the fact that …
6) Thus, we may include that …

10) Письменно переведите текст со словарем (30 мин)

Concrete Cracking

1) Запомните слова, необходимые для работы над текстом

♦ cracking - трещинообразование, образование трещин; растрескивание; расщепление
♦ extent - степень, мера
♦ arched bridge – арочный мост

♦ volume – объём
♦ the cracked area - треснувшая площадь
♦ compressive loads - сдавливающие нагрузки
♦ slender - стройный, тонкий
♦ shrinkage - усадка; усушка; сжимание
♦ stress - (механическое) напряжение; напряжённое состояние
♦ due to- из-за, по причине
♦ various means – различные средства
♦ fine - мелкозернистый
♦ water tanks – цистерна, бассейн
♦ highway – шоссе, автомагистраль
♦ saw-cuts - пропил; распил
♦ autogenous shrinkage- автогенная усадка
♦ shrinkage cracking - трещинообразование от усадки
♦ thermal effect – тепловой эффект
♦ restraint – сжатие, стягивание
♦ dry shrinkage – усадка при высыхании
♦ reinforcement - армирование
♦ spacing of reinforcement – размещение арматуры
♦ induced bending – вынужденное, форсированное сгибание, искривление
♦ magnitude – значение (цифровое), величина
♦ the coefficient of thermal expansion – коэффициент теплового (термического) расширения
♦ thermal conductivity – удельная теплопроводность
♦ fireproofing - огнестойкий состав
♦ loss - потеря
♦ decomposition - расщепление
♦ yield - выработка; производить
yield of concrete – выход бетона
♦ calcite – кальцит, известковый шпат
♦ expose – подвергать действию
♦ approximately – приблизительно
♦ liquid - жидкость
♦ come into contact – прийти в соприкосновение

2) Прочтите и переведите текст

All concrete structures will crack to some extent. One of the early designers of reinforced concrete, Robert Maillart, employed reinforced concrete in a number of arched bridges. His first bridge was simple, using a large volume of concrete. He then realized that much of the concrete was very cracked, and could not be a part of the structure under compressive loads, yet the structure clearly worked. His later designs simply removed the cracked areas, leaving slender, beautiful concrete arches.

Concrete cracks due to tensile stress induced by shrinkage or stresses occurring during setting or use. Various means are used to overcome this. Fiber reinforced concrete uses fine fibers distributed throughout the mix or larger metal or other reinforcement elements to limit the size and extent of cracks. In many large structures joints or concealed saw-cuts are placed in the concrete as it sets to make the inevitable cracks occur where they can be managed and out of sight. Water tanks and highways are examples of structures requiring crack control.

Shrinkage cracks occur when concrete members undergo restrained volumetric changes (shrinkage) as a result of either drying, autogenous shrinkage or thermal effects. Restraint is provided either externally (i.e. supports, walls, and other boundary conditions) or internally (differential drying shrinkage, reinforcement). Once the tensile strength of the concrete is exceeded, a crack will develop. The number and width of shrinkage cracks that develop are influenced by the amount of shrinkage that occurs, the amount of restraint present and the amount and spacing of reinforcement provided.

Plastic-shrinkage cracks are immediately apparent, visible within 0 to 2 days of placement, while drying-shrinkage cracks develop over time.

Tension cracking.

Concrete members may be put into tension by applied loads. This is most common in concrete beams where a transversely applied load will put one surface into compression and the opposite surface into tension due to induced bending. The portion of the beam that is in tension may crack. The size and length of cracks is dependent on the magnitude of the bending moment and the design of the reinforcing in the beam at the point under consideration. Reinforced concrete beams are designed to crack in tension rather than in compression. This is achieved by providing reinforcing steel which yields before failure of the concrete in compression occurs and allowing remediation, repair, or if necessary, evacuation of an unsafe area.

Physical properties.

The coefficient of thermal expansion of Portland cement concrete is 0.000008 to 0.000012 (per degree Celsius) (8-12 1/MK). The density varies, but is around 150 pounds per cubic foot (2400 kg/m³).

Due to its low thermal conductivity, a layer of concrete is frequently used for fireproofing of steel structures. However, concrete itself may be damaged by fire.

Up to about 300 °C, the concrete undergoes normal thermal expansion. Above that temperature, shrinkage occurs due to water loss; however, the aggregate continues expanding, which causes internal stresses. Up to about 500 °C, the major structural changes are carbonation and coarsening of pores. At 573 °C, quartz undergoes rapid expansion due to Phase transition, and at 900 °C calcite starts shrinking due to decomposition. At 450-550 °C the cement hydrate decomposes, yielding calcium oxide. Calcium carbonate decomposes at about 600°C. Rehydration of the calcium oxide on cooling of the structure causes expansion, which can cause damage to material which withstood fire without

falling apart. Concrete in buildings that experienced a fire and were left standing for several years shows extensive degree of carbonation.

Concrete exposed to up to 100 °C is normally considered as healthy. The parts of a concrete structure that is exposed to temperatures above approximately 300 °C (dependent of water/cement ratio) will most likely get a pink color. Over approximately 600 °C the concrete will turn light grey, and over approximately 1000 °C it turns yellow-brown. One rule of thumb is to consider all pink colored concrete as damaged, and to be removed.

Fire will expose the concrete to gases and liquids that can be harmful to the concrete, among other salts and acids that occur when gasses produced by fire come into contact with water.

3) Прочтите текст и найдите ответы на следующие вопросы:

Will all concrete structures crack to some extent?
Who employed reinforced concrete in a number of arched bridges?

Why are various means used?

What does **fiber reinforced concrete** use to limit the size and extent of cracks?

When do shrinkage cracks occur?

What may be put into tension by applied loads?

Does shrinkage causes tensile stresses in the concrete?

When does the concrete turn light grey?

4) Прочтите текст и скажите, соответствуют ли следующие утверждения содержанию текста:

1) Regular concrete uses fine fibers distributed throughout the mix or larger metal or other reinforcement elements to limit the size and extent of cracks.
2) Restraint is provided either externally (i.e. supports, walls, and other boundary conditions) or internally (differential drying shrinkage, reinforcement).
3) The number and width of shrinkage cracks that develop are influenced by the amount of shrinkage that occurs, the amount of restraint present and the amount and spacing of reinforcement provided.
4) The size and length of cracks is not dependent on the magnitude of the bending moment and the design of the reinforcing in the beam at the point under consideration.
5) The coefficient of thermal expansion of Portland cement concrete is 0.0000012 to 0.000023 (per degree Celsius).
6) Concrete exposed to up to 100 °C is normally considered as healthy.

7) The parts of a concrete structure that is exposed to temperatures above approximately 500 °C (dependent of water/cement ratio) will most likely get a pink color.

5) Прочтите данный отрывок, разделите его на абзацы и назовите каждый из них

Concrete cracks due to tensile stress induced by shrinkage or stresses occurring during setting or use. Various means are used to overcome this. Fiber reinforced concrete uses fine fibers distributed throughout the mix or larger metal or other reinforcement elements to limit the size and extent of cracks. In many large structures joints or concealed saw-cuts are placed in the concrete as it sets to make the inevitable cracks occur where they can be managed and out of sight. Water tanks and highways are examples of structures requiring crack control. Shrinkage cracks occur when concrete members undergo restrained volumetric changes (shrinkage) as a result of either drying, autogenous shrinkage or thermal effects. Restraint is provided either externally (i.e. supports, walls, and other boundary conditions) or internally (differential drying shrinkage, reinforcement). Once the tensile strength of the concrete is exceeded, a crack will develop. The number and width of shrinkage cracks that develop are influenced by the amount of shrinkage that occurs, the amount of restraint present and the amount and spacing of reinforcement provided. Plastic-shrinkage cracks are immediately apparent, visible within 0 to 2 days of placement, while drying-shrinkage cracks develop over time.

6) Заполните пропуски эквивалентами на английском языке

(Составляющие бетона) may be put into tension by applied loads. This is most common in (бетонные балки) where a transversely applied load will put one surface into (сжатие) and the opposite surface into tension due to induced bending. The portion of the beam that is in tension may (треснуть). The size and length of cracks is dependent on the magnitude of the (момент изгиба) and the design of the reinforcing in the beam at the point under consideration. (Железобетонные балки) are designed to crack in tension rather than in compression.

7) Письменно переведите следующий отрывок(30 минут):

Physical properties of concrete.

The coefficient of thermal expansion of Portland cement concrete is 0.000008 to 0.000012 (per degree Celsius) (8-12 1/MK). The density varies, but is around 150 pounds per cubic foot (2400 kg/m^3).

Due to its low thermal conductivity, a layer of concrete is frequently used for fireproofing of steel structures. However, concrete itself may be damaged by fire.

Up to about 300 °C, the concrete undergoes normal thermal expansion. Above that temperature, shrinkage occurs due to water loss; however, the aggregate continues expanding, which causes internal stresses. Up to about 500 °C, the major structural changes are carbonation and coarsening of pores. At 573 °C, quartz undergoes rapid expansion due to Phase transition, and at 900 °C calcite starts shrinking due to decomposition. At 450-550 °C the cement hydrate decomposes, yielding calcium oxide. Calcium carbonate decomposes at about 600°C. Rehydration of the calcium oxide on cooling of the structure causes expansion, which can cause damage to material which withstood fire without falling apart. Concrete in buildings that experienced a fire and were left standing for several years shows extensive degree of carbonation.

Concrete exposed to up to 100 °C is normally considered as healthy. The parts of a concrete structure that is exposed to temperatures above approximately 300 °C (dependent of water/cement ratio) will most likely get a pink color. Over approximately 600 °C the concrete will turn light grey, and over approximately 1000 °C it turns yellow-brown. One rule of thumb is to consider all pink colored concrete as damaged, and to be removed.

Fire will expose the concrete to gases and liquids that can be harmful to the concrete, among other salts and acids that occur when gasses produced by fire come into contact with water.

8) Прочтите текст ещё раз и сформулируйте основную мысль каждого абзаца

9) Составьте план текста

10) Воспроизведите текст по плану

Types of concrete

1) Запомните слова, необходимые для работы над текстом:

♦ term - термин
♦ purpose - цель
♦ pre-mixed concrete – предварительно перемешанный бетон
♦ batch – замес бетона
♦ mortar – строительный раствор
♦ twigs - веточки
♦ high-strength concrete – высокопрочный бетон
♦ compressive strength - прочность на сжатие
♦ workable - рентабельный
♦ ratio – соотношение, пропорция

♦ mixture - смесь
♦ at a void – под вакуумом
♦ high-performance concrete – бетон с хорошими рабочими характеристиками
♦ limit – ограничивать; предел, граница
♦ placement - размещение
♦ long-term - долгосрочный, длительный
♦ permeability - проницаемость
♦ toughness – вязкость, прочность
♦ severe - суровый
♦ fluidity – текучесть, жидкое состояние
♦ to compact - уплотнять
♦ labor costs – оплата труда
♦ wear and tear – износ, амортизация
♦ seepage – фильтрация, просачивание
♦ tunneling – проходка туннеля
♦ formwork - опалубка
♦ dry-mix – сухая смесь
♦ shotcrete – торкрет - бетон
♦ nozzle – выпускное отверстие
♦ hose – рукав, труба, шланг
♦ accelerators – катализатор, ускоритель
♦ pervious concrete – проницаемый бетон
♦ fine aggregate (fines) – мелкий заполнитель
♦ paste – паста, замазка
♦ cellular concrete – ячеистый бетон
♦ bituminous materials – битумные материалы
♦ binder – связующее вещество, строительный раствор
♦ lime – известь

2) Прочтите и переведите текст

Various types of concrete have been developed for specialist application and have become known by these names.

Regular concrete is the lay term describing concrete that is produced by following the mixing instructions that are commonly published on packets of cement, typically using sand or other common material as the aggregate, and often mixed in improvised containers. This concrete can be produced to yield a varying strength from about 10 MPa (1450 psi) to about 40 MPa (5800 psi), depending on the purpose, ranging from blinding to structural concrete respectively. Many types of pre-mixed concrete are available which include powdered cement mixed with an aggregate, needing only water.

Typically, a batch of concrete can be made by using 1 part Portland cement, 2 parts dry sand, 3 parts dry stone, 1/2 part water. The parts are in terms of weight

– not volume. For example, 1-cubic-foot (0.028 m^3) of concrete would be made using 22 lb (10.0 kg) cement, 10 lb (4.5 kg) water, 41 lb (19 kg) dry sand, 70 lb (32 kg) dry stone (1/2" to 3/4" stone). This would make 1-cubic-foot (0.028 m^3) of concrete and would weigh about 143 lb (65 kg). The sand should be mortar or brick sand (washed and filtered if possible) and the stone should be washed if possible. Organic materials (leaves, twigs, etc) should be removed from the sand and stone to ensure the highest strength.

High-strength concrete

High-strength concrete has a compressive strength generally greater than 6,000 pounds per square inch (40 MPa = 5800 psi). High-strength concrete is made by lowering the water-cement (W/C) ratio to 0.35 or lower. Often silica fume is added to prevent the formation of free calcium hydroxide crystals in the cement matrix, which might reduce the strength at the cement-aggregate bond.

Low W/C ratios and the use of silica fume make concrete mixes significantly less workable, which is particularly likely to be a problem in high-strength concrete applications where dense rebar cages are likely to be used. To compensate for the reduced workability, superplasticizers are commonly added to high-strength mixtures. Aggregate must be selected carefully for high-strength mixes, as weaker aggregates may not be strong enough to resist the loads imposed on the concrete and cause failure to start in the aggregate rather than in the matrix or at a void, as normally occurs in regular concrete. In some applications of high-strength concrete the design criterion is the elastic modulus rather than the ultimate compressive strength.

High-performance concrete

High-performance concrete (HPC) is a relatively new term used to describe concrete that conforms to a set of standards above those of the most common applications, but not limited to strength. While all high-strength concrete is also high-performance, not all high-performance concrete is high-strength. Some examples of such standards currently used in relation to HPC are:

- Ease of placement
- Compaction without segregation
- Early age strength
- Long-term mechanical properties
- Permeability
- Density
- Heat of hydration
- Toughness
- Volume stability
- Long life in severe environments

Self-consolidating concretes

During the 1980s a number of countries including Japan, Sweden and France developed concretes that are self-compacting, known as self-consolidating concrete in the United States. This self-consolidating concrete (SCCs) is characterized by:

- extreme fluidity as measured by *flow*, typically between 650-750 mm on a flow table, rather than slump(height)
- no need for vibrators to compact the concrete
- placement being easier.
- no bleed water, or aggregate segregation

SCC can save up to 50% in labor costs due to 80% faster pouring and reduced wear and tear on formwork.

As of 2005, self-consolidating concretes account for 10-15% of concrete sales in some European countries. In the US precast concrete industry, SCC represents over 75% of concrete production. 38 departments of transportation in the US accept the use of SCC for road and bridge projects.

This emerging technology is made possible by the use of polycarboxylates plasticizer instead of older naphthalene based polymers, and viscosity modifiers to address aggregate segregation.

Shotcrete

Shotcrete (also known by the trade name *Gunite*) uses compressed air to shoot concrete onto (or into) a frame or structure. Shotcrete is frequently used against vertical soil or rock surfaces, as it eliminates the need for formwork. It is sometimes used for rock support, especially in tunneling. Shotcrete is also used for applications where seepage is an issue to limit the amount of water entering a construction site due to a high water table or other sub-terranian sources. This type of concrete is often used as a quick fix for weathering for loose soil types in construction zones.

There are two application methods for shotcrete.

- dry-mix – the dry mixture of cement and aggregates is filled into the machine and conveyed with compressed air through the hoses. The water needed for the hydration is added at the nozzle.
- wet-mix – the mixes are prepared with all necessary water for hydration. The mixes are pumped through the hoses. At the nozzle compressed air is added for spraying.

For both methods additives such as accelerators and fiber reinforcement may be used.

Pervious concrete.

Pervious concrete contains a network of holes or voids, to allow air or water to move through the concrete. It is formed by leaving out some or all of the fine aggregate (fines), the remaining large aggregate then is bound by a relatively small amount of cement paste. When set, typically between 15 and 25% of the concrete volume are voids, allowing water to drain at around 5 gal/ft²/ min or 200 L/m²/min) through the concrete.

Pervious concrete allows water to drain naturally through roadway or other structures, reducing the amount of artificial drainage needed, and allowing the water to naturally replenish groundwater. It can significantly reduce noise, by allowing air squeezed between vehicle tires and the roadway to escape.

Cellular concrete.

Aerated concrete produced by the addition of an air entraining agent to the concrete (or a lightweight aggregate like expanded clay pellets or cork granules and vermiculite) is sometimes called Cellular concrete.

Roller-compacted concrete.

Roller-compacted concrete, sometimes called rollcrete, is a low-cement-content stiff concrete placed using techniques borrowed from earthmoving and paving work. The concrete is placed on the surface to be covered, and is compacted in place using large heavy rollers typically used in earthwork. The concrete mix achieves a high density and cures over time into a strong monolithic block. Roller-compacted concrete is typically used for concrete pavement, but has also been used to build concrete dams, as the low cement content causes less heat to be generated while curing than typical for conventionally placed massive concrete pours.

Glass concrete

The use of recycled glass as aggregate in concrete has become popular in modern times, with large scale research being carried out at Columbia University in New York. This greatly enhances the aesthetic appeal of the concrete. Recent research findings have shown that concrete made with recycled glass aggregates have shown better long term strength and better thermal insulation due to its better thermal properties of the glass aggregates.

Asphalt concrete

Strictly speaking, asphalt is a form of concrete as well, with bituminous materials replacing cement as the binder.

Rapid strength concrete

This type of concrete is able to develop high resistance within few hours after being manufactured. This feature has advantages such as removing the formwork early and to move forward in the building process at record time, repair road surfaces that become fully operational in just a few hours.

Rubberized concrete

While "rubberized asphalt concrete" is common, rubberized Portland cement concrete ("rubberized PCC") is still undergoing experimental tests, as of 2007.

Polymer concrete

Polymer concrete is concrete which uses polymers to bind the aggregate. Polymer concrete can gain a lot of strength in a short amount of time. For example, a polymer mix may reach 5000 psi in only four hours. Polymer concrete is generally more expensive than conventional concretes.

Geopolymer or *green* concrete

Geopolymer concrete is a greener alternative to ordinary Portland cement made from inorganic aluminosilicate (Al-Si) polymer compounds that can utilise 100% recycled industrial waste (e.g. fly ash and slag) as the manufacturing inputs resulting in up to 80% lower carbon dioxide emissions. Greater chemical and thermal resistance, and better mechanical properties, are said to be achieved by the manufacturer at both atmospheric and extreme conditions.

Similar concretes have not only been used in Ancient Rome (see Roman concrete) as mentioned but also in the former Soviet Union in the 1950s and

1960s. Buildings in the Ukraine are still standing after 45 years so that this kind of formulation has a sound track record.

Limecrete

Limecrete or lime concrete is concrete where cement is replaced by lime.

3) Прочтите текст и найдите ответы на следующие вопросы:

- What types of concrete have been developed for specialist application?
- What does the term “Regular concrete” mean?
- What is the strength of Regular concrete?
- How can a batch of concrete be made?
- What does the term “High-strength concrete” mean?
- What does the term “High-performance concrete” mean?
- What is the self-consolidating concrete (SCCs) is characterized by?
- Where does shotcrete use?

4) Составьте вопросы к выделенным словам

Pervious concrete contains a network of holes or voids, to allow **air or water** to move through the concrete. It is formed by leaving out **some or all of the fine aggregate (fines)**, the remaining large aggregate then is bound by a relatively small amount of cement paste. When set, typically between 15 and 25% of the concrete volume are **voids**, allowing water to drain at around 5 gal/ft²/ min or 200 L/m²/min) through the concrete.

Pervious concrete **allows** water to drain naturally through roadway or other structures, reducing the amount of artificial drainage needed, and allowing the water to naturally replenish groundwater. It can significantly **reduce noise**, by allowing air squeezed between vehicle tires and the roadway to escape.

5) Письменно переведите следующие предложения:

1) Shotcrete (also known by the trade name *Gunite*) uses compressed air to shoot concrete onto (or into) a frame or structure.

2) Typically, a batch of concrete can be made by using 1 part Portland cement, 2 parts dry sand, 3 parts dry stone, 1/2 part water

3) This would make 1-cubic-foot (0.028 m^3) of concrete and would weigh about 143 lb (65 kg).

4) High-strength concrete is made by lowering the water-cement (W/C) ratio to 0.35 or lower.

6) Заполните пропуски эквивалентами на английском языке

Concrete can be (изготовлен) in such a way that it cannot be destroyed by (действием) of water and weather in a period covering several generations. Concrete does not (покрывается) rusty like steel, or (гнить) like wood. Small animals, such as white ants cannot destroy it. Concrete can even be made (непроницаемый) to water by the use of certain admixtures.

7) Переведите письменно текст

8) Составьте реферат, используя следующие выражения:

- the title of the text is…
- the text concerns the problem (information, data) on…
- the main idea of the text is…
- I`d like to underline (stress) that…
- In conclusion I`d like to pay your attention to the fact that…
- Thus we may conclude that…

Cement

1) Запомните слова, необходимые для работы над текстом:

♦ powdered- порошкообразный
♦ concrete compound – бетонная смесь
♦ decisive - имеющий решающее значение
♦ addition- добавление, дополнение
♦ solidify- делать твёрдым; твердеть; затвердевать
♦ hardening- отвердевание, затвердевание
♦ exclusively- единственно, исключительно
♦ sulphate- сульфат, соль серной кислоты
♦ calcining - обжиг, прокаливание
♦ alumina- глинозём, окись алюминия
♦ aggregate – заполнитель, инертный материал
♦ hardening – схватывание бетона
♦ wash off - смывать
♦ blast-furnace slag – доменный шлак
♦ ore - руда
♦ cooling - охлаждение
♦ clay - глина

♦ setting period – период застывания

2) Прочтите и переведите текст

Cement is a grey powder mass; it is usually packed in paper bags or supplied in storage bins. In a concrete compound, the portion of cement is smaller than that of the aggregate. However, cement is the basic material which is decisive for the quality of the concrete. In general, one part by volume of cement binds the threefold quantity of aggregate. The binding power of cement becomes active only after the addition of water. Cement starts solidifying one hour after the water has been added. Therefore, concrete must be used within an hour after mixing. The total process of hardening ends after about 28 days. The strength increases rapidly in the, beginning of the hardening period, whereas the rate of increase in strength is much lower later on. The hardening of cement is not caused by drying as it is the case with loam, by a chemical transformation of substances initiated by the addition of water. Cement will also harden under water. Therefore, it is called hydraulic cement. While it is setting (beginning of hardening), cement generates heat (heat of setting). A paste made up exclusively of cement shrinks and cracks when hardening. When cement is allowed to act on human skin for a longer time, the skin may get affected. That is why cement powder must be properly washed off after work. Cements are made of limestone and clay. This mixture is calcified at high temperatures and subsequently ground up into fine powdered. By adding water to the powdered cement it will again get as hard as rock. Similar properties are obtained in Rhenish trass, pozzolanic materials (special types of rock), and blast-furnace slag, if they are finely ground. Blast-furnace slags are by-j products from the production of iron. Different types of cement are obtained depending on the kind and composition of the raw materials used. The most usual types are Portland cement, blast-furnace cement, sulphate resisting cement, and ore cement. Some of these types of cement are available in different qualities as regards their strength values. Portland cement is the most widely used type of cement. It is made of limestone and clay by calcining and grinding and can be used for all normal masonry and concrete work. Portland cement has a light grey-green colour. Iron Portland cement contains at least 70 per cent of the same raw materials used for Portland cement, and about 30 per cent of blast-furnace slag has a bluish-green colour. The other properties are similar to those of Portland cement. Blast-furnace cement resembles iron Portland cement. The proportion of blast-furnace slag to the whole of the raw materials may come up to 85 per sent. The setting period of blast-furnace cement is longer than that of the above mentioned types of cement. This cement generates less heat of setting than other types and has a higher resistance to chemical attacks. Sulphate resisting cement is made of blast-furnace slag and gypsum with additions of small quantities of Portland cement. The heat developed during the selling period is also of a lower temperature than that produced in Portland cement. The resistance to chemical attacks of sulphate resisting cement is higher than that of Portland cement. Sulphate resisting cement must not be mixed

with other binders. Concrete fabricated of sulphate resisting cement must not directly get into touch with fresh concrete made up of other types of cement. That is to say, it must be separated by an intermediate layer. Ore cement is similar to Portland cement. However, the proportion of clay to the whole of the raw materials used is a little smaller in favor of the proportion of iron oxide. Ore cement is particularly suitable for structures to be erected in Sea-water. Alumina cement contains a percentage of alumina and only a little of limestone. It has a blue-black or brown colour. In the beginning it is setting but slowly, reaching, however, high initial strength values thereafter. The heat generated during setting is so high that it may become necessary to take special cooling measures.

3) Прочтите текст и скажите, соответствуют ли следующие утверждения содержанию текста:

1. Cement is the basic material which is decisive for the quality of the concrete.
2. The binding power of cement becomes active before the addition of water.
3. Concrete must be used within two hours after mixing
4. Cement powder must not be properly washed off after work.
5. Cements are made of limestone and clay.
6. Portland cement has a light grey colour.
7. The resistance to chemical attacks of sulphate resisting cement is higher than that of Portland cement.
8. Ore cement is particularly suitable for structures to be erected in Sea-water.

4) Прочтите текст, разделите его на абзацы и назовите каждый из них

5) Прочтите текст ещё раз и задайте по два вопроса к каждому абзацу

6) Составьте реферат, используя следующие выражения:

- the title of the text is…
- the text concerns the problem (information, data) on…
- the main idea of the text is…
- I`d like to underline (stress) that…
- In conclusion I`d like to pay your attention to the fact that…
- Thus we may conclude that…

Reinforced concrete

1) Прочтите заглавие текста и скажите, о чем здесь идет речь.
2) Запомните слова необходимые для работы над текстом;

♦reinforced concrete - железобетон
♦ renforcement bars (re-bars) - арматурный стержень
♦ brittle – хрупкий, ломкий
♦ to strengthen- усиливаться; укрепляться; делаться более крепким
♦the coefficient of thermal expansion - коэффициент теплового ♦расширения
♦tensile strength- предел прочности на разрыв
♦encompass- окружать; заключать
♦ internal stress – внутреннее напряжение
♦ contraction – сжатие, сокращение
♦ calcium carbonate (lime) – углекислый кальций (известь)
♦ roughened- делать шероховатым
♦corrugated- рифлёный; гофрированный;
♦ the bond- сцепление бетона с предварительно напряжённой арматурой
♦ cohesion – связность
♦ alkaline-щелочной
♦ passivating-пассивированный
♦ to corrosion - разъедать
♦cross-section – поперечное сечение
♦ hollow- полость
♦ hollow core- полая деталь
♦ moisture- влажность
♦humidity- влажность
♦hot dip galvanised - нанесение покрытия способом окунания в ♦подогретый пропиточный состав
♦ epoxy- coated- покрытый эпоксидной смолой
♦sheen -блеск, сияние
♦stainless steel rebar- арматурная сталь; арматурный пруток; арматурный профиль (для железобетона)
♦ sheen- блеск, сияние
♦ freeze/thaw cycle – цикл заморозки / оттаивания
♦shrinkage – сжатие, сжимание
♦de-icing – борьба с обледенением
♦ mechanical failure- механический отказ;
♦ corrode- разъедать
♦ to flake- выпадать хлопьями

3) Прочитайте и переведите текст:

Reinforced concrete is concrete in which reinforcement bars ("rebars") or fibers have been incorporated to strengthen a material that would otherwise be brittle. In industrialised countries, nearly all concrete used in construction is reinforced concrete.

Concrete is reinforced to give it extra tensile strength; without reinforcement, many concrete buildings would not have been possible. Reinforced concrete can encompass many types of structures and components, including slabs, walls, beams, columns, foundations, and frames.

The first application of reinforced concrete as a material for the construction of buildings took place in 1864 when William Boutland Wilkinson built a house in Newcastle-Upon-Tyne, UK. The German company Wayss & Freitag was formed in 1875, with A.G. Wayss publishing a book on reinforced concrete in 1887. Their major competitor in Europe was the firm of Francois Hennebique, set up in 1892.

A reinforced concrete system was patented in the United States by Thaddeus Hyatt in 1878. The first reinforced concrete building constructed in the United States was the Pacific Coast Borax Company's refinery in Alameda, California, built in 1893.

Key characteristics

Three physical characteristics give reinforced concrete its special properties. First, the coefficient of thermal expansion of concrete is similar to that of steel, eliminating internal stresses due to differences in thermal expansion or contraction. Second, when the cement paste within the concrete hardens this conforms to the surface details of the steel, permitting any stress to be transmitted efficiently between the different materials. Usually steel bars are roughened or corrugated to further improve the bond or cohesion between the concrete and steel. Third, the alkaline chemical environment provided by calcium carbonate (lime) causes a passivating film to form on the surface of the steel, making it much more resistant to corrosion than it would be in neutral or acidic conditions.

The relative cross-sectional area of steel required for typical reinforced concrete is usually quite small and varies from 1% for most beams and slabs to 6% for some columns. Reinforcing bars are normally round in cross-section and vary in diameter. Reinforced concrete structures sometimes have provisions such as ventilated hollow cores to control their moisture and humidity.

Anti-corrosion measures.

In wet and cold climates, reinforced concrete for roads, bridges, parking structures and other structures that may be exposed to deicing salt may benefit from use of epoxy-coated, hot dip galvanised or stainless steel rebar, although good design and a well-chosen cement mix may provide sufficient protection for many applications. Epoxy coated rebar can easily be identified by the light green colour of its epoxy coating. Hot dip galvanized rebar may be bright or dull grey depending on length of exposure, and stainless rebar exhibits a typical white metallic sheen that is readily distinguishable from carbon steel reinforcing bar.

Reinforced concrete can fail due to inadequate strength, leading to mechanical failure, or due to a reduction in its durability. Corrosion and freeze/thaw cycles may damage poorly designed or constructed reinforced concrete. When rebar corrodes, the oxidation products (rust) expand and tends to flake, cracking the concrete.

Mechanical failure.

Reinforced concrete can be considered to fail when significant cracks occur. Cracking of the concrete section can not be prevented, however the size of the cracks can be limited and controlled by reinforcement. Cracking defects can allow moisture to penetrate and corrode the reinforcement. This is a serviceability failure in limit state design. Cracking is normally the result of an inadequate quantity of rebar, or rebar spaced at too great a distance. The concrete then cracks either under excess loading, or due to internal effects such as early thermal shrinkage when it cures.

Ultimate failure leading to collapse can be caused by crushing of the concrete matrix, when stresses exceed its strength; by yielding of the rebar; or by bond failure between the concrete and the rebar.

4)Ответьте на следующие вопросы:

- What is reinforced concrete?
- When was reinforced concrete first used?
- When and where was reinforced concrete system patented?
- What are reinforced concrete characteristics?
- What are anti-corrosion measures?
- How can cracks be limited and controlled?

5) Прочтите текст и скажите соответствуют ли следующие утверждения содержанию текста:

- Reinforced concrete can be characterized as a brittle material.
- Without reinforcement, many concrete buildings would have been possible.
- 3) The first reinforced concrete building constructed in the United States was the Pacific Coast Borax Company's refinery in Alameda, California, built in 1893.
- 4) The coefficient of thermal expansion of concrete is similar to that of steel.
- 5) Reinforcing bars are normally square in cross-section.
- 6) In wet and cold climates reinforced concrete is not used.
- 7) Cracking of the concrete section can be prevented.

6)Составьте план текста.

7) Прочитайте текст еще раз и составьте вопросы.

8) Переведите следующие предложения на русский язык:

Cracking is normally the result of an inadequate quantity of rebar, or rebar spaced at too great a distance. Epoxy coated rebar can easily be identified by the light green colour of its epoxy coating. Corrosion and freeze/thaw cycles may damage poorly designed or constructed reinforced concrete. Reinforced concrete is concrete in which reinforcement bars ("rebars") or fibers have been incorporated to strengthen a material that would otherwise be brittle. In industrialized countries, nearly all concrete used in construction is reinforced concrete. The first reinforced concrete building constructed in the United States was the Pacific Coast Borax Company's refinery in Alameda, California, built in 1893.

9) Составьте вопросы, которые помогли бы вам сделать пересказ текста.

10) Сделайте пересказ текста, используя следующие выражения;

1) The title of the text is …
2) The text concerns the problem(information, data) …
3) The main idea of the text is …
4) I'd like to underline (stress) that …
5) In conclusion I'd like to pay your attention to the fact that …
6) Thus, we may include that …

11) Письменно переведите текст со словарем (30 мин)