UZBEKISTAN REPUBLIC OF
MINISTRY OF HIGHER EDUCATION, SCIENCE AND INNOVATION R LEAGUE

NAMANGAN ENGINEERING-CONSTRUCTION INSTITUTE

FACULTY OF CONSTRUCTION

"ARCHITECTURE" DEPARTMENT

I.M.QOSIMOV

"MODERN BUILDING MATERIALS AND CONSTRUCTION TECHNIQUES "
science according to

EDUCATIONAL-METHODICAL COMPLEX

UZBEKISTAN REPUBLIC OF
MINISTRY OF HIGHER EDUCATION, SCIENCE AND INNOVATION R LEAGUE

NAMANGAN ENGINEERING-CONSTRUCTION INSTITUTE

List _ _ received :
No. _____
20 23 year _ "___" _____

"I APPROVE"
Vice-rector for academic affairs
_____ Q. Inoyatov
2023 "____ "_____

DEPARTMENT OF "CONSTRUCTION MATERIALS AND ITEMS".

I.M. KASIMOV

"MODERN BUILDING MATERIALS AND CONSTRUCTION TECHNIQUES "

STUDY – METHODOLOGY COMPLEX

Namangan-2023

This educational methodological complex is 5340500- DTS of production of construction materials, products and constructions and modern construction materials and constructions ” was created based on the requirements of the sample program of the subject.

Developer:	
I. Kasimov	NamMQI "Architecture" department associate professor (PhD)
Reviewer:	
B. Rizaev	NamMQI "QMB" department associate professor

NamMQI " QMB " department at the ___ meeting of "__"_____2023 discussed.

The teaching-methodological complex is recommended for use in the educational process in accordance with the decision of the Methodological Council of the Namangan Engineering-Construction Institute No.

TABLE OF CONTENTS

SYLLABUS

Full name of the training course:	Modern building materials and structures		
Short name of the course:	QMBKICH	5340 5 00	
Department:	Building materials, production of goods and constructions		
Teacher about info : _	Arx. fbfd Ilhom Kasimov assistant		
Semester and duration of study course:	Semester 5, 12 weeks		
Amount of training hours:	**Total:**	134	
	Also:		
	Lecture	20	
	Practical	16	
	Independent education	30	
Routing name and password:	Production of building materials, products and constructions	5340 5 00	
Preliminary preparation:	Gaining knowledge in such subjects as "Higher mathematics", "Physics", "Construction materials", Engineering geodesy, Thermal engineering, Construction structures, Construction organization, "Resistance of materials", "Construction mechanics", and "Architecture".		
Subject and content of the course:			
The goals and objectives of teaching the course:			
For students requirements	- To treat the professor-teacher with respect; - Compliance with the Institute's disciplinary rules; - Turn off the mobile phone during the lesson; - Completion of assigned tasks on time; - Treating teammates with respect; - Plagiarism is prohibited; - Coming to class on time; - In case of missing a lesson for more than 4 hours, entering the lesson with the permission of the dean's office.		
Email through relationships order	The communication between the professor and the student can be done by e-mail, the issue of assessment over the phone is not discussed, but the intermediate, current and final assessment is carried out only on the premises of the institute , in separate rooms and during the lesson.		
Time for tips and assignments:	Wednesday Friday	15.00-16.30 14.30-15.30	Aud. 7/301 Aud. 7/301

Lecture sessions

Enter. Status and prospects of construction materials production in Uzbekistan. goals and tasks of science, history of development and its prospects. The role of construction materials and products in the economy of Uzbekistan. Use of construction materials, raw materials, industrial waste. Classification of construction materials, products, standardization. State standards. Building codes and regulations.

Educational technologies used: Visual lecture, blitz-question, statement, cluster, "yes-no" technique.

Teaching tools: Text of lectures, projector, handouts, graphic organizers.

References: A1 -A-6 ; Q8 ; _ Q9 . _

Directions and prospects of production and use of reinforced concrete

Educational technologies used: Visual lecture, blitz-question, statement, cluster, "yes-no" technique

Teaching tools: Text of lectures, projector, handouts, graphic organizers

References: A4 - A6, Q7 , Q8 , Q9 . Q10

2nd lecture

Topic : **Made of mineral and silicate fiber**

plastic fittings, Basalt and polypropylene fibers

Educational technologies used: Visual lecture, blitz-question, statement, cluster, "yes-no" technique

Teaching tools: Text of lectures, projector, handouts, graphic organizers

References: A4 - A6, Q7 , Q8 , Q9 . Q10

3rd lecture

Topic : **Continuous formwork preparation of reinforced concrete structures on long stands**

Educational technologies used: Visual lecture, blitz-question, statement, cluster, "yes-no" technique

Teaching tools: Text of lectures, projector, handouts, graphic organizers

References: A4 - A6, Q7 , Q8 , Q9 . Q10

Topic : **Continuous formwork preparation of reinforced concrete structures on long stands**

Educational technologies used: Visual lecture, blitz-question, statement, cluster, "yes-no" technique

Teaching tools: Text of lectures, projector, handouts, graphic organizers

References: A4 - A6, Q7 , Q8 , Q9 . Q10

4th lecture

Topic : **Classifications of chemical additives for concretes and mixtures**

Educational technologies used: Visual lecture, blitz-question, statement, cluster, "yes-no" technique

Teaching tools: Text of lectures, projector, handouts, graphic organizers

Topic : **Superplasticizers. Complex additives for concrete and mixtures**

Educational technologies used: Visual lecture, blitz-question, statement, cluster, "yes-no" technique

Teaching tools: Text of lectures, projector, handouts, graphic organizers

5th lecture

Topic : **Modern wall materials. General information.**
Wall stone materials, wall panels. Multi-layer wood, monolithic walls. Use of non-removable formwork during construction of buildings

Educational technologies used: Visual lecture, blitz-question, statement, cluster, "yes-no" technique

Teaching tools: Text of lectures, projector, handouts, graphic organizers

6th lecture

Topic : **Pardevors for modern Pardevors .**
The main classifications of curtains. Panels made of pilita and blocks, framed, modular glass block curtains. Curtains in wet rooms

Educational technologies used: Visual lecture, blitz-question, statement, cluster, "yes-no" technique

Teaching tools: Text of lectures, projector, handouts, graphic organizers

7th lecture

Topic : **Modern thermal insulation materials**

Educational technologies used: Visual lecture, blitz-question, statement, cluster, "yes-no" technique

Teaching tools: Text of lectures, projector, handouts, graphic organizers

Topic : **Modern decorative building materials. Aquapanel. Plasterboard sheets, glass magnetic sheets . Production technologist**

Educational technologies used: Visual lecture, blitz-question, statement, cluster, "yes-no" technique

Teaching tools: Text of lectures, projector, handouts, graphic organizers

8th lecture

Topic : **Modern tompop material. Basic classifications, tile coatings, metal sheets**

Educational technologies used: Visual lecture, blitz-question, statement, cluster, "yes-no" technique

Teaching tools: Text of lectures, projector, handouts, graphic organizers

Topic : **Modern materials for floors. Warm floors,**
Cast floors, parquet floors, laminate floor coverings, Kavralans

Educational technologies used: Visual lecture, blitz-question, statement, cluster, "yes-no" technique

Teaching tools: Text of lectures, projector, handouts, graphic organizers

9th lecture

Topic : **Use of biotechnology in the construction industry.**
From biotechnologies in the preparation of wood composites Usage.

Educational technologies used: Visual lecture, blitz-question, statement, cluster, "yes-no" technique

Teaching tools: Text of lectures, projector, handouts, graphic organizers

10th lecture

Topic : **Basic concepts about nonotechnologies.**
Experiences and perspectives of using elements of non-technology in construction materials science

Educational technologies used: Visual lecture, blitz-question, statement, cluster, "yes-no" technique

Teaching tools: Text of lectures, projector, handouts, graphic organizers

II. INTERACTIVE EDUCATIONAL METHODS USED IN TEACHING THE MODULE

1. "Working in small groups" method

Working in small groups is a method that requires students to divide into small groups and develop ways to solve the given task in order to perform a certain task given by the teacher.

Using this method, the student will have the right to work in small groups, actively participate in the lesson, be in the role of leader, learn from each other and appreciate different points of view.

When the method of working in small groups is used, the pedagogue has the opportunity to save time compared to other non-traditional methods. Because the pedagogue can attract and evaluate all students at the same time.

Method of use

1. Choose an activity. A problem related to the topic is chosen in such a way that, as a result, it is necessary for students to perform creative activities in order to learn (perform) it, and tasks are determined.
2. Creating the necessary foundation. In order to participate in small group work, students must already have some knowledge, skills and competences in the chosen activity.
3. Forming a group. Usually there are 3-5 students in each group, (maybe less or more). If working in a group requires the preparation of one or another written document, it is preferable to form a group of 2-3 people . In the group work between students _ tasks sure to distribution relies on (Example for , one student discussion manages , the second writing goes , the third takes the role of speaker (sardor) . and hakozo). Auditorium to groups separation , desire according to b or account according to b done is increased .
4. Clearly y o' l - y ' mows k show . _ To the students activity perform according to b sure and volume in terms of many p _ b is not dead explanation is given pedagogue of groups work speed differently to be _ in consideration received without time the limit says _ Groups necessary materials and information with it is

estimated . Students in the group work start for study _ _ duties sure understand i'm done checking will be seen .

5. Support _ _ _ _ and direction . _ _ pedagogue necessity if born _ groups next to queue - queue come correct _ _ _ _ direction _ _ that it is working note is enough or to them help gives to groups pressure will not be held .

Discussion to do and evaluation . Groups final stage the work results according to _ information they give Of this for each one group own _ _ captain determines _ Necessity birth of science results according to _ reported thoughts pedagogue by writing will go The important thing is in the group problem solution to be justified clarified is to get If time enough if it is _ _ or this the idea in argumentation groups to each other question too to give can _ Small in groups work results pedagogue evaluated by In this activity correct _ _ _ _ and sure execution , time spending main criterion is considered

Advantages of working in small groups:

- leads to better mastering of teaching content;
- leads to improvement of communication skills;
- there is an opportunity to save time;
- all students are involved;
- there will be an opportunity for self- and inter-group assessment.

Disadvantages of the method of working in small groups:

- because there are weak students, there is a possibility that strong students will also receive a failing grade;
- control over all students will be low;
- negative intergroup rivalries may occur;
- There may be conflict within the group.

" Working in small groups" in the study of the topic " Condition and prospects of production of construction materials in Uzbekistan "

"Working in small groups" method is a creative work in the lesson aimed at learning the educational material or completing the assigned task by dividing them into small groups in order to activate the learners.

When this method is used, the learner will have the right to work in small groups, actively participate in the lesson, be in the role of leader, learn from each other and appreciate different points of view.

When the method of "working in small groups" is used, the teacher has the opportunity to save time compared to other interactive methods. Because the teacher can attract and evaluate all students at the same time.

Below is a study of the state and prospects of construction materials production in Uzbekistan Here are the stages of the "Working in small groups" method:

1. The direction of activity is determined. Interrelated issues are determined by the topic:

what methods of production of building materials do you know ?

processes in pottery firing .

2. Small groups are defined. Students can be divided into groups of 3-6 people: each group gives its own name (for example, "Bunyodkor", "Advanced", etc.)
3. Small groups begin to complete the task.

They write their thoughts on the given issue on a sheet of paper (for example, if ceramic objects are not dried before cooking, they can be deformed and broken under the influence of internal forces during cooking in a high temperature environment)

4. The teacher gives clear instructions and directs (what should be paid attention to when solving the problem).
5. Small groups make a presentation (each group explains the information written on the sheets on solving the problem on the board).
6. Completed tasks are discussed and analyzed (all students can participate in the discussion and analysis).
7. The activity of small groups is evaluated (Group students and the activity of the small group as a whole are evaluated. Actively participating students are encouraged)

2. "Discussion" method

Argument-discussion is a method of teaching in which students are divided into two groups and conducted in the form of mutual debate and exchange of opinions on a topic.

This method is used, provided that any topics and problems are discussed on the basis of existing knowledge and experience. The task of leading the discussion can be assigned to one of the students. It is necessary to conduct the discussion freely and try to involve every student in the discussion. During the implementation of this method, it is necessary to try to immediately eliminate the conflicts that arise between students.

Advantages of the debate method:

- encourages students to think independently;
- students try to prove the correctness of their opinion;
- helps students to develop listening skills.

Disadvantages of the debate method:

- requires management skills from the pedagogue;
- It is necessary to choose a topic that is suitable and interesting for students' level of knowledge.

The methodology of using the "discussion" method in the teaching of the topic "Glass and glass crystal materials"

"Discussion" method is a teaching method that is conducted in the form of mutual discussion and exchange of ideas with students on a topic.

This method is used assuming that any topics and problems are discussed on the basis of existing knowledge and experience. The task of leading the debate can be given to one of the students or the teacher himself. It is necessary to conduct the discussion freely and try to involve every student in the discussion.

The following rules should be followed when conducting the "discussion" method:

- create opportunities for all students to participate;
- culture of listening to ideas;
- non-repetition of expressed opinions;
- mutual respect for each other.

Below are the steps of the "Discussion" method in studying the topic of glass materials:

1. The teacher chooses the topic of the discussion and develops questions about it, asks the students a question about the problem and invites them to the discussion.

Discussion topic: Glass materials.

Questions about the topic:

- What material is called glass ?
- How many years ago did glass production begin?
- The widespread use of glass sheets in construction dates back to what century?
- According to classification, glass and glassware are divided into what groups?
- What are the groups of glass and glass products according to their function?
- What raw materials are used to make glass ?
- What additives are used to obtain colored glass?
- Stages of glass production technology?
- Explain the main properties of glass .
- What are the groups of glassware?

2. The teacher writes down the answers to the given question, that is, different ideas and opinions, or assigns one of the students to perform this task. At this stage, the teacher creates conditions for students to freely express their thoughts.
3. The teacher divides, summarizes and analyzes the expressed thoughts and ideas together with the students.

As a result of the analysis, the most optimal solution to the given problem is selected.

3. "Insert" method

"Insert" method Purpose of the method: This method is used to facilitate students' acceptance of a new information system and knowledge acquisition, and this method also serves as a memory exercise for students. **Procedure for implementing the method:**

prepares a handout and presentation of the content of the main concepts of the subject before the lesson ;

essence of the new topic is distributed to the students and presented in the form of a presentation;

 Learners get to know the text individually and express their personal views through special symbols. When working with the text, students are advised to use the following special characters:

" Portlandcement " by the " Insert" method.

V (familiar information)	+ **(** this information is new to me **)**	- (Is this opinion against this information?)	? (I did not understand this information, I need an explanation)
Mineral binding materials are powdery and form a liquid or rubber mixture when mixed with small and large fillers in water, and as a result of gradual solidification, it turns into an artificial stone. Hydraulic binding material portland cement is obtained by burning chalk, limestone, dolomite and marly limestone with a content of up to 25% calcium and magnesium carbonate . This powdery product can be gray, white or colored.	Mineral binders are divided into air-hardening binders and hydraulic binders depending on their use and properties. portland cement can harden both in air and in moisture. portland cement clinker is made by adding gypsum . fineness level of portland cement is 2500-3000 cm ^{2} G'g, hardening time is from 45 minutes to 10 hours, brands 400, 500, 550, 600. depending on the types of portland cement, it is used	The raw material contains up to 25% clay.	Various additions to clinker Various portland cements are obtained by adding s.

There are 5 cement factories in Uzbekistan (Bekabod, Okhangaron, Navoi, Angren, Kuvasoy)	in different areas of construction.		

4. "Problem situation" method

Problem situation is a method based on analyzing problem situations and providing students with their solutions.

The complexity of the task selected for the "Problem Situation" method should correspond to the level of knowledge of the students. They must be able to find a solution to the given problem, otherwise, failing to find a solution will cause students to lose interest and self-confidence.

Advantages of the "problematic situation" method:

- forms independent thinking skills in students;
- students learn to weave causes, differences, and effects;
- a good opportunity is created to evaluate students' knowledge and experience;
- students learn to analyze ideas and results.

Disadvantages of the "problematic situation" method:

- high motivation is required in students;
- the set problem should correspond to the students' level of knowledge;
- it takes a lot of time.

Methodology of "Concrete" subject using the "Problem situation" method

The "problematic situation" method is a method aimed at forming students' skills in analyzing the causes and consequences of problematic situations and finding their solutions.

The complexity of the problem chosen for the "Problem Situation" method should correspond to the students' level of knowledge. Using this method, students learn to think independently, analyze the causes and consequences of a problem, and find its solution.

Table 1 shows the steps of the "Problem Situation" method in the study of concrete.

Steps t.r. _	Teacher	Students
1	Selects and describes a problem situation. Problematic situation: Ways to reduce water consumption. Problem: Why reduce water consumption?	They hear the problem situation
2	Introduces the purpose and tasks of the assignment, explains the evaluation criteria. The purpose of the assignment: to study the problem of the effect of water consumption on concrete strength	They get acquainted with the purpose and tasks of the assignment
3	Divide students into small groups using cards	They join small groups
4	Shows ways to study a problem situation.	They study the problem situation.
5	Sums up the same ideas	During the given time, they will present their opinions about the consequences of the problem: To reduce water consumption: 1. Adding chemical additives 2. Correct choice of concrete composition 3. Use of solid compounds, etc
6	Shows ways to solve a problem situation	They discuss different options for solving the problem
7	Listens to the students' presentation on the solution to the problem situation	They present a solution to a problem situation
8	Chooses the best option to solve the problem situation	They participate in choosing the most optimal solution to the problem situation
9	Assesses student knowledge	
10	Gives homework	They do their homework using the recommended literature

5. "Brainstorming" method

Although it is recognized that "brainstorming" was developed by American scientists, the authors of this method are our ancestors. Whether you take our encyclopedic scholars (Ahmad al-Farghani, Abu Nasr Farabi, Ibn Sina, Beruni, etc.) who enlightened the world with their intellectual torch at a time when America was not yet discovered, or whether you take our horned sultans who conquered seven climates, they solved their problems. this method was widely used in solving. Our grandfathers called this method differently, i.e.: "council", "consultation",

"consultation". For example, Sahibgiron Amir Temur called a council to solve the problems facing the kingdom, carefully listened to the opinions of the courtiers, ministers, and his children, and based on them, made a single decision. These situations are more often seen in the councils called before the military campaign. "If I wanted to raise an army (against my grain), I would stop talking about war and truce and try to find out which of these two my emirs are inclined towards. If they talk about peace, I would compare the benefit of it with the loss of war, if they were inclined to war, I would compare the benefits and benefits of peace with the loss of peace, and I would choose which one is more beneficial." Today, thinking about these things, we are once again convinced that "the West learned from the East". Brainstorming is a method of generating (developing) ideas. "Brainstorming" method is the most effective method to solve a problem by paying free opinions and opinions expressed by students and coming to a certain solution through them. There are written and oral forms of the brainstorming method. Each of the students verbally expresses his opinion to the question given by the teacher in oral form . Students state their answers clearly and concisely. In the written form, students write their answers to the given question on paper cards in a short and visible way. The answers are attached to the board (using magnets) or the keyboard (using pins). In the written form of the "Brainstorming" method, it is possible to group the answers by certain characters. This type of method, when applied positively, teaches a person to think freely, creatively and non-standardly.

When using the brainstorming method, there is an opportunity to involve all students, including the formation of a culture of communication and discussion among students. Students develop the ability to express their thoughts not only verbally, but also in writing, logical and systematic thinking. The non-evaluation of expressed opinions leads to the formation of different ideas in students. This method serves to develop creative thinking in students.

The "Brainstorming" method is implemented depending on the goal set by the pedagogue:

1. **When the goal is to determine the basic knowledge of students, this method is implemented in the introduction to the subject of the lesson.**
2. **Repetition of a topic or connection of one topic to the next is done in the transition to a new topic.**
3. **Consolidation of the learned subject is carried out in the reinforcement part of the lesson, after the subject is set as a goal.**

The stages of using the "brainstorming" method are as follows:

1. Students are asked a question and they are asked to give their answers (opinion, reasoning) to this question;

2. **Students express their opinion on the question;**

3. Students' ideas are recorded (on a tape recorder, video tape, colored paper or blackboard);

4. Ideas are grouped by certain signs;

5. A clear and correct answer to the above question is selected.

The main rules for using the "brainstorming" method:

1. Opinions expressed are not discussed and evaluated.
2. Any opinions expressed will be considered, even if they are not correct.
3. The ideas expressed can be supplemented and further expanded.

As an example, we will consider the solution of the problem "Effective use of thermal insulation materials in construction" in the topic "Heat insulation materials" of the subject "Construction materials". Depending on the number of students in the auditorium, they are divided into two groups A and B of 6-12 people. Groups are led by R-leader.

Students of groups A and B should know the types of warm insulation materials and their properties in advance to solve the given problem.

And the leader must have conducted training on the subject of hot insulation materials. Group A students develop problems and ideas. Group B students analyze problems and ideas. The leader organizes the problems and solutions of group A and B students and guides them.

The leader throws the following problem among the students to solve the problem:

List the advantages of thermal insulation materials?

A	B
1) The thickness and mass of walls and structures is reduced 2) Trans'ort costs are reduced 3) It has the ability to absorb sound	1) The consumption of the main structural elements is reduced 2) The cost of construction will increase 3) Can be used as acoustic materials

The leader summarizes the answers of the students of group A and B and declares that the answers are correct.

Such an approach to teaching the science of construction materials serves to predict the creative approach to the lesson based on independent thinking of students during the lesson. As a result of independent solving of the problems by the students and the pedagogue summarizing the students' thoughts and putting them in the right direction, the efficiency of the students' mastery of the problems increases. As a result, students' knowledge, understanding, application, analysis and evaluation of the material will improve.

6 . "Problem situation" method

The "problematic situation" method is a method aimed at forming students' skills in analyzing the causes and consequences of problematic situations and finding their solutions.

The complexity of the problem chosen for the "Problem Situation" method should correspond to the students' level of knowledge. Using this method, students learn to think independently, analyze the causes and consequences of a problem, and find its solution.

Methodology of "Concrete" subject using the "Problem situation" method

Table 1 shows the steps of the "Problem Situation" method in the study of concrete.

Steps Tr	Teacher	Students
1	Selects and describes a problem situation. Problematic situation: Ways to reduce water consumption. Problem: Why reduce water consumption?	They hear the problem situation

2	Introduces the purpose and tasks of the assignment, explains the evaluation criteria. The purpose of the assignment: to study the problem of the effect of water consumption on concrete strength	They get acquainted with the purpose and tasks of the assignment
3	Divide students into small groups using cards	They join small groups
4	Shows ways to study a problem situation.	They study the problem situation.
5	Sums up the same ideas	During the given time, they will present their opinions about the consequences of the problem: To reduce water consumption: 1. Adding chemical additives 2. Correct choice of concrete composition 3. Use of solid compounds, etc
6	Shows ways to solve a problem situation	They discuss different options for solving the problem
7	Listens to the students' presentation on the solution to the problem situation	They present a solution to a problem situation
8	Chooses the best option to solve the problem situation	They participate in choosing the most optimal solution to the problem situation
9	Assesses student knowledge	
10	Gives homework	They do their homework using the recommended literature

Identify energy saving measures in precast concrete production enterprises

No	TSex or department	Loss of energy resources	Measures to save ener resources
1	**Concrete mixing department**	Portland cement unloading, storage. When choosing a concrete composition. of poor quality fillers .	
2	Fitting shop	Malfunction of the equipment for the preparation of fittings. Armature waste.	
3	Molding workshop	The technological process is not properly organized . Q oliping equipment failure.	
4	Heat treatment department	Disadvantages of heat treatment . Chambers are not tightly closed, steam heating.	

7. ESSAY

Various methods can be used to assess students' knowledge: writing an ESSAY, solving tests, using handouts, questionnaires, etc.

ESSAY is a task to write a short statement (essay) in the final part of the lesson on a part of the topic covered to check the students' knowledge. It takes 5-10 minutes. After the allotted time for writing the ESSAY, essays will be collected and graded.

Below is the procedure for writing an ESSAY on the topic "Artificial stone materials and products made of mineral binders" in the silicate concrete section.

ESSAY

Topic: Silicate concretes

*Silicate concretes **are** lime-sand cement-free concretes that harden in an autoclave. lime-ash and another is a large group obtained on the basis of lime-sand binders. In addition, crushed blast furnace slag is also used as a binder.*

Silicate concretes can have a dense and porous structure. Fine-grained dense silicate concrete is a type of heavy concrete, in contrast to which silicate concrete does not contain large aggregates (gravel or crushed stone). The structure of silicate concrete is homogeneous , and the price is very cheap .

8. The method of creating a sink (information collection).

Syncway is a technique used to better understand the identified learning objectives of the lesson and the material being studied.

The concept of "cinquevain" means "five" when translated from French.

Cinquain is a unique, non-rhyming poem consisting of five lines, in which information about the studied concept, event, event, topic is collected in the words of the reader in different versions and from different perspectives. is expressed. Syntax is an important skill for expressing complex ideas, intuitions, and feelings in just a few words. The process of creating a syncway helps to better understand the topic.

The rule of composition of syncway:

1. In the first line, the subject (task) is represented by one word (usually by "noun").

2. In the second line, the subject is expressed by two adjectives.

3. In the third line, the behavior within the subject is expressed in three words.

4. In the fourth line, an opinion (intuition) is written, which means the attitude towards the subject and consists of four words.

5. In the last line, write one word that repeats the essence of the topic and has a meaning close to it.

are examples of Cinquain construction on the topic "Bituminous and Resinous Binders" :

SINKV E YN

1.

1. Bitumen	**noun** (*who?, what?)*
2. T is natural and artificial	**quality** *(how?, what kind?)*
3. Acts as a connector	**verb** *(what does it do?)*
4.Q intermediate colored solids	**imagination** *(what kind of imagination in the mind wakes up?)*
5. Connector	**noun** (*synonyms)*

2.

1. Resin	**noun** (*who?, what?)*
2. Binding material	**quality** *(how?, what kind?)*
3. Acts as a connector	**verb** *(what does it do?)*
4. Brown oily viscous liquid	**imagination** *(what kind of imagination in the mind wakes up?)*
5. Connector	**noun** (*synonym)*

8. K laster - the method of "spreading information".

The word "cluster" means a bud, a bundle. Clustering is a pedagogical strategy that develops independent creative thinking in students, the ability to establish connections between concepts in the subject. Clustering can be used to stimulate

thinking at the invitation, realization, and reflection stages. It is basically a strategy to generate new ideas, access existing knowledge, and encourage new thinking on a particular topic.

Clustering sequence:

1. The name of the topic or an important "key" word is written in the middle of the sheet.

2. All logically related thoughts and ideas that come to mind on the topic are written in one word and placed in sequence. Spelling and other errors of words are not taken into account.

3. Continue to write down ideas that come to mind until time runs out. If ideas do not come to mind, it is necessary to draw something on paper until new ideas appear.

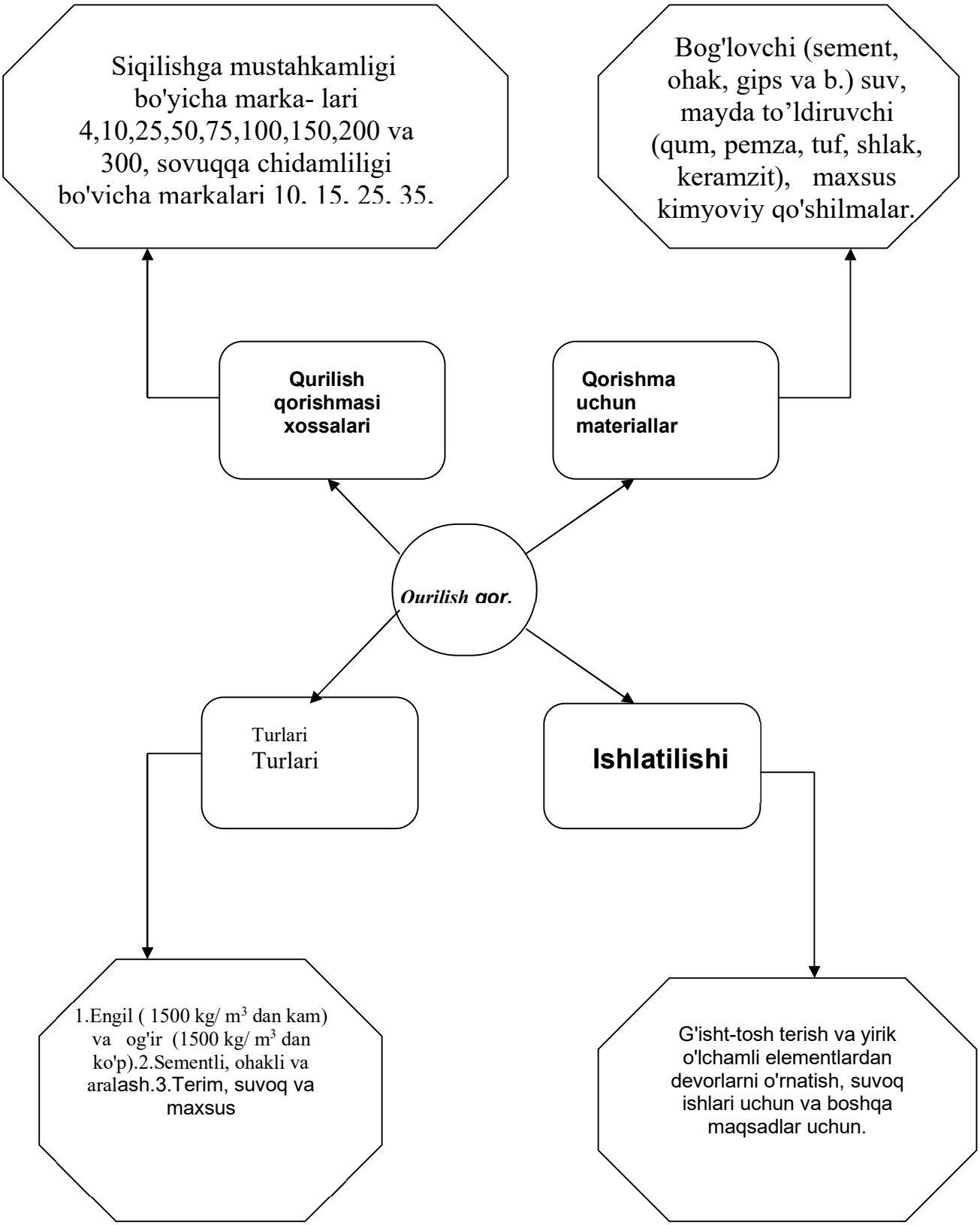
As many connections as possible are made between ideas. The number of ideas, their flow and connections between them are not limited.

4. Using the information obtained in the comprehension (mastery) stage, students should develop all possible solutions. the more options the better.

5. The process of creating a cluster will be completed and the students who actively participated in it will be encouraged.

Below is an example of clustering in the analysis of the topic "Construction mixes".

CLUSTER on the topic of construction mix



9. Case study technology

The word "Case" comes from the Latin word "casus" - "event, incident". In other words, this concept refers to an event or event that occurs in life, a detail of a specific situation. In general, a case-stage (a specific case or situation) is expressed in words, numbers, and images of the actual reality that occurs in a specific process. In addition, this expression is used in the field of education, as a shorthand for information used to research an event or situation. Unlike a simple description of an event or situation, a case study contains information that helps to master the learning material, which is achieved by identifying the problem encountered and looking for ways to solve it. It is necessary to develop a case-study as a means of obtaining knowledge for a specific educational purpose. These objectives are broad in scope and involve information, data, or details that can be used to demonstrate specific views or methods. It should be noted that different approaches are necessary when using the term "case study" in the areas of teaching and research.

Experts use this term to intensively study, express and analyze organizations, as a result of which a new theory is created, the existing theory is tested, and new solutions are determined.

In the case, open information can be used for analysis as a situation from a specific event. Case actions include: Who, When, Where, Why, How, What.

There are different ways of expressing the content and detail of situations. A case study can range from just a few sentences to hundreds of pages in length. Students faced with a large case study usually believe that the greater the detail of the case study, the more complex it is. This is a false conclusion – because most short cases are more complicated. When creating a case, it is not necessary to use its written form to express a specific situation. Photographs, videos, audio recordings or slides can be used to represent situations. All these tools help the students to embody the situation closer to reality. At the same time, written information is easier to process and analyze than, for example, photographic information. In these cases, it is necessary to supplement the photographs with

written information. It is appropriate to use case studies using information from resources in teaching students who have experience in studying written cases.

Case-study (certain situations) can represent problems that are perceived by individuals, partners, groups, enterprises, even on the scale of the whole country according to its educational nature. Cases can be used in various fields of education: business, management, medicine, architecture, construction, and in all disciplines that require the ability to accept the solution of a non-standard set of problems.

With the help of "case-study", problems in teaching are identified, solutions are filled, and recommendations are developed.

Quality case studies take a lot of time to prepare, formalize and review. At the same time, a case-study, properly structured and included in the subject of study, provides an opportunity to achieve the desired results in mastering the subject.

It is recommended to follow the following sequence of working case studies:

- Develop case study goals and objectives
- Selection of materials according to the goals and objectives of the case
- Consists of primary processing and analysis of materials.
- Determining the type of case
- Adapting the material according to the purpose and task of the case
- Technical composition of case text and questions.
- Case arobation (trial).

The student's work with the case within the framework of the specific case method qualification consists of the following:

- individual case study analysis;
- analysis of the case study in a small group;
- discuss the case study with the teacher in the audience.

It is expedient to introduce the case study in arabation in several stages.

The entire case study should be read very quickly for the first time . In this case, the speed of reading should be determined by the possibility of retelling it.

The second reading of the case should be more attentive and careful, and its speed is determined by making sense of what has been read. For a large case study, this can take anywhere from two to four hours. The analysis of the case study is evaluated at this stage.

The third reading of the case study is final. It is best to do this the night before training. It can be useful to read the case study from the beginning, then "rewind" from the end, after discussing the evidence and events in a small group, to reexamine and clarify.

Forming the final version of the case text (together with step-by-step instructions **).** At this stage, the corrected text of the case is prepared, taking into account the shortcomings introduced according to the results of the verification. Particular attention is paid to the method of organizing work with students on the case. This methodology will be very useful for those who want to become pedagogues in the future

Stages of implementation of the "case method".

Work steps	**Form and content of activity**
Step 1: Introduction to the case and its information supply	□□ individual audio-visual work; □□ acquaintance with the case (in text, audio or media form); □□ generalization of information; □□ information analysis; □□ identifying problems
Step 2: Clarify the case and define the training task	□□work individually and in groups; □□determining the priority hierarchy of problems; □□define the main problem situation
Step 3: Finding a solution to the learning task by analyzing the main problem in the case, developing solutions	□□work individually and in groups; □□development of alternative solutions; □□Analysis of opportunities and obstacles of each solution;

Stage 4: Forming and justifying the case solution, presentation.	□ □selection of alternative solutions □ Individual and group work; □ □justification of possibilities of practical application of alternative options; □ □creative project presentation preparation; □ □covering the practical objects of the final conclusion and solution of the situation

III. THEORETICAL MATERIALS

1- Lecture _ _ ***Status and prospects of construction materials production in Uzbekistan***

(lecture -2 hours)

1.1. It is a technolo gy to conduct a lecture

Study time: 2 hours Number of students: 50

Training form Informative lecture _

Lecture plan

1. Enter. Raw material base for production of building materials in Uzbekistan.
2. Construction materials production situation and prospects.

The purpose of the training session: to acquaint students with information about the state and prospects of production of construction materials in Uzbekistan .

' educational tasks:	*Learning outcomes:*
The report provides insights into the raw material base for the production of building materials in Uzbekistan .	They will learn about the raw material base for the production of building materials in Uzbekistan.
Provides information on the state and prospects of construction materials production	They will learn about the state and prospects of construction materials production.
Teaching tools	Lecture text, blackboard, computer, slides.
Teaching methods	Informative lecture, blitz survey,
Teaching forms	Work in a team.
Teaching environment	Estimated audience by technical means.
Monitoring and evaluation	Oral questions.

Technological map of the subject of providing an understanding of the state and prospects of production of construction materials in Uzbekistan .

Work steps	**The content of the teacher's activity**	**The content of the listener's activity**
Stage 1 Introduction to the topic (10 min)	1.1. Explains the topic, plan and results of educational activities. Introduces requirements for students. (Appendix 1) 1.2. Gives a list of literature used in science. (Appendix 2) 1.3. Introduces course evaluation criteria (Appendix 3). 1.4. Asks questions to enliven the topic. (Appendix 4).	They listen. They write They listen. They answer questions.
Stage 2. Main section (60 min)	2.1. Gives a lecture (Appendix 5). 2.2. Asks questions to strengthen the lecture. (Appendix 6)	They listen and write. They listen and answer.
Stage 3. Finisher (10 min)		

Status and prospects of construction materials production in Uzbekistan

In the Republic of Uzbekistan, many residential, public, industrial, rural buildings and facilities are newly built, and large-scale renovation works are being carried out.

Under the leadership of the first President of our country, Islam Karimov, the scope of creative work has expanded, the demand for construction materials and their production volume is increasing. Today, the results of the huge creative works carried out in our cities and villages are expressed in wide and smooth roads, modern bridges, majestic structures and buildings with high hospitality solutions, comfortable houses, houses that embody our national values. . This is a sign that the way of life, life and living conditions of our people are fundamentally changing.

With the decision of the head of state on August 3, 2009 "On additional measures to expand the scope of housing construction in rural areas", modern housing is being built in all regions of our country on the basis of model projects. , is an important factor in creating conditions no less than in the city. In 2013, more than 2,500 single-family houses were put into use on the basis of model projects, and 155 new enterprises specializing in the preparation of raw materials and materials for construction started their work.

High-quality production of traditional building materials on a scientific basis, adaptation of their creation technologies to modern requirements, development of cheap, economical and high-quality materials and technologies, obtaining new and refined materials from the waste collected in enterprises, creating their cost-effective technologies, repairing buildings and structures , perfecting the methods of reconstruction, as well as the effective use of materials in this process are among the important issues.

In the decree of the first President of the Republic of Uzbekistan No. F-3586 of March 24, 2005 "On deepening economic reforms and accelerating the development of the building materials industry", new construction materials production as the main directions of further deepening economic reforms and accelerating the development of the building materials industry mastering and implementation of modern technologies are shown.

This decree envisages increasing the volume of production of construction materials, specifying their types, mastering and applying new modern technologies,

and rationally locating the production capacities of construction materials in the regions of the Republic. During 2010, a total of 120 projects were implemented.

Our republic is rich in mineral and raw material resources sufficient for the building materials industry, and now more than 500 raw material deposits have been identified. In the Central Asian region, our country occupies a leading position in terms of reserves of raw materials for the production of construction materials. In order to enrich the consumer market with modern construction materials, to meet the demand and need for it, our state pays special attention to the development of the industry.

Among them, as an example, in the Tashkent region, the joint enterprise "'entUz" produces soft soil-making materials, in the Bukhara region, the world-famous "Knauf" company produces 20 mln. per year. m^2 is fully automated based on modern technologies. Launching of production of plasterboard products and dry building mixes in the Republic of Karakalpakstan with a capacity of 1 mln. construction of Uzbek-American joint enterprise "Rahnamo-Nur" in Navoi region with a capacity of 12 mln. Examples include organizing the production of glass with a size of m^2, implementing the project of organizing the production of ceramogranite products in cooperation with "Italceramica" company in Tashkent. The role of the joint-stock company "Ozkhurilishmaterialari" in the implementation of these works should be specially recognized. This company has a special role in providing the construction facilities of our country, the construction market of the Republic with high-quality, modern construction materials produced from local raw materials, and serving to increase the volume of exports.

This study the manual serves as a useful and necessary source of information for bachelors and masters studying in higher educational institutions in the field of architecture and construction, as well as for students of vocational colleges.

Base of raw materials for production of building materials in the Republic of Uzbekistan

Raw material	Identified deposits		Time of use, years
	quantity	reserve size	

Cement raw materials, including: - limestone	**26 11**	**1,178 mln. t 620 mln. t**	**70**
- gilturoks	**12**	**504 mln. t**	**221**
Building stones, including:	**29**	**250 mln. m ^{3}**	**143**
- marble, marbleized limestones	**17**	**30 mln. m ^{3}**	**112**
- granite	**10**	**158 mln. t**	**271**
- sandstone	**1**	**2 mln. t**	
- travertine limestones	**1**	**59 tsks. m ^{3}**	**27**
Brick raw materials	**160**	**418 mln. m ^{3}**	**142**
Keramsite and agloorite raw materials	**10**	**119 million m ^{3}**	**2528**
Wall stones	**2**	**10 mln. m ^{3}**	**78**

About 25% of the total cost of material resources in capital construction goes to concrete and reinforced concrete structures. This is much higher than the price and size of other building structures. With the physical and mechanical properties of concrete and reinforced concrete, durability and technical and economic efficiency in production, as well as sufficient raw material resources, the building material with the highest potential in capital construction now and in the future remains.

Currently, in our Republic, it is required to prepare reinforced concrete structures from lightweight concrete based on gpovac aggregates. For example, reinforced cement constructions, gpovac (cellular) and aerated concrete. These solve the issues of lightening the constructions in a certain amount. Lightening of constructions leads to saving the amount of reinforcement and cement, reducing the cross section of the constructions and extending their life span. Lightened constructions affected by seismic forces are of particular importance, they absorb a certain amount of dynamic forces.

The main issue in capital and construction in general is to improve the production and coating of reinforced concrete structures, improve their quality, and cover scientific and technical achievements in construction. In order to solve these issues, improving concrete technology, improving its properties, preparing and applying new high-performance aerated concretes, mainly obtaining light, high-strength aerated concretes with chemical coatings, improving the product quality,

training qualified personnel, the basics of concrete science, reinforced concrete In-depth familiarization with the basics of production and technological calculations of constructions is of great importance.

Looking at the perspective of the production and use of reinforced concrete products, the following main directions can be highlighted:

- Creation and use of large-scale structures and objects;
- Use of high strength and prestressed concrete;
- Wider use of lightweight concrete and thin-walled spatial constructions;
- Reducing the cost of products

of buildings and structures based on monolithic reinforced concrete is an urgent issue in the construction complex of developed countries. The monolithic construction system is characterized by the pouring of reinforced concrete products and structures into pre-made unified precast molds of any shape.

When buildings and structures are built using the monolithic method , the construction time is shortened, assembly work is drastically reduced, the strength of the building increases, and there is no need for a warehouse on the construction site.

Today, instead of heavy metal molds, the use of universal molds made of light hard metal and fiberglass is causing further development of the monolithic construction system.

the dry and hot climate of Uzbekistan, pouring monolithic concrete requires special measures. In this case, it is necessary to pay special attention to concrete mixture transportation, molding, especially maintenance. In the construction of car roofs, airfield pavements and similar reinforced concrete monolithic constructions with a large surface , disposable materials (polyethylene, polypropylene plastic , etc.) and polymers (ethinol lacquer, gel polymers) are used to maintain the concrete .

When monolithic concreting is carried out in winter, the main issue is to protect the concrete mix and hardened concrete from freezing. There are different ways to protect monolithic concrete from freezing. These include temporary coating of concrete with thermal insulation materials, addition of additives that lower the

freezing point of water (sodium chloride, calcium chloride, etc.) to the concrete mix, and the ``thermos'' method. As heat insulation materials, half-baker mineral plate, glass wool mats (topshams), waterproofing coated arbolite, xelolite plates, gpovac fillers, etc. is used.

2 - Lecture _ _	**Directions and prospects of production and use of reinforced concrete**

(lecture-2 hours)

1.1. Conducting the lecture is a technolo giya

Study time: 2 hours	Number of students: 50
Training form	Informative lecture
Lecture plan	1. Directions of production and use of reinforced concrete 2. Prospects of production and use of reinforced concrete
The purpose of the training session: To acquaint students with information on the directions and perspectives of production and use of reinforced concrete .	
educational tasks:	*Learning outcomes:*
Directions of production and use of reinforced concrete gives information about.	Directions of production and use of reinforced concrete in the lecture they understand the importance and essence.
Provides information on the prospects of production and use of reinforced concrete .	They get acquainted with the prospects of production and use of reinforced concrete
Teaching tools	Lecture text, blackboard, computer, projector, slides.
Teaching methods	Informative lecture, blitz poll, brainstorming,
Teaching forms	Work in a team.
Teaching environment	An audience that can be estimated by technical means, and the method of working in groups can be applied.
Monitoring and evaluation	Oral questions.

Technological map of the topic of directions and prospects of reinforced concrete production and use .

Work steps	The content of the teacher's activity	The content of the listener's activity
Stage 1 Introduction to the topic (10 min)	1.1. Explains the topic, plan and results of educational activities. 1.2. Asks questions to enliven the topic. (Appendix 1).	They listen. They answer questions. They listen.
Stage 2. Main section	2.1. Gives a lecture (Appendix 2).	They listen and write.

(60 min)	2.2. Asks questions to strengthen the lecture. (Appendix 3)	They listen and answer.
Stage 3. Finisher (10 min)	3.1. Includes concluding remarks on the exercise. 3.2. He asks questions to prepare for the next topic. (Appendix 6).	They ask questions. They listen and write. .

Directions and prospects of production and use of reinforced concrete CONCRETES

Products and constructions made on the basis of concrete and reinforced concrete remain modern even in the 21st century.

In the early 60s of the 20th century, the highest strength of concrete was 40 Mpa, in the 70s - 50 Mpa, in the 80s - 70 Mpa, and in the 90s - 100-150 Mpa. Interest in "high performance concrete" - **NRS (High performance Concrete) is growing. This type of concrete is designed to have high individual properties, such as high compressive strength in shear and bending, resistance to chemical aggressive substances and gases, and waterproofing.**

Until now, RpC (Roactive powder concrete) concretes with a strength of up to 800 MPa, specially selected composition and dispersion of components have become the peak of these works.

The existing experience and requirements in construction allow to highlight the promising directions of the concrete mixture and concrete modification groups:

- **to improve the properties of concrete and concrete mixtures by adding multifunctional modifiers based on surfactants and electrolytes with different properties to their composition, water-soluble and water-miscible, polyfunctional modifiers;**
- **controllers of hardening and strengthening processes, including creation of organic acids and oligomer-polymer compositions that do not cause corrosion of reinforcement;**

- **expansion of the base of raw materials, use of modifying additives allows obtaining high-strength and high-quality concrete.**

The International Organization for Construction considers high-strength concrete, the compressive strength of cylinders made from it to be 60-130 Mpa, and high-quality concrete with a water-cement ratio of less than 0.4 and high operational properties. In construction, such concrete is widely used in Japan, Norway, USA and France.

As the main value of such concretes, it is necessary to emphasize their good placement, the possibility of easy transfer with the help of pumps, and their durability. Currently, the main areas of their use are skyscrapers, power stations, marine hydrotechnical facilities, large-scale proletarian coprics, engineering facilities, and construction of roofs .

Currently, according to the international measurement systems, the strength of copra concretes is evaluated by their compression class. When the standard coefficients are 13.5% for construction concretes, 18% for heat-insulating concretes , their closest brand in terms of strength class is presented in Table 2.

The average strength of concrete of each class is determined by the following formula:

$$\boldsymbol{R = \frac{B}{0,0980665(1 - 1,64\upsilon)}},$$

where : V is the value of concrete class , Mpa;

0.0980665 – coefficient of expansion from Mpa to kg/cm ^{2};

υ- coefficient of variation.

2 - table.

Classes and brands of concrete

Strength class of concrete	The average strength of concrete of this class is R , kgs/cm ^{2}	The closest brand of concrete in terms of strength
In compression		
V0.35	5.01	M5
V0.75	10.85	M10
V1	14.47	M15
V1.5	20.85	M25
V2	28.94	M25
V2.5	32.74	M35
V3.5	45.8	M50
V5	65.5	M75

V7.5	98.2	M100
V10	130.97	M150
V15	196.5	M200
V20	261.9	M250
V22.5	294.5	M300
V25	327.4	M350
VZO	392.9	M400
V35	458.4	M450
V40	523.9	M550
V45	589.4	M600
V50	654.8	M700
V55	720.3	M700
V60	785.8	M800
V65	851.5	M900
V70	917.0	M900
V75	932.5	M1000
V80	1048.0	M1000
Stretch along the axis _		
Bt 0.4	5.2	R5
Bt 0.8	10.5	R10
Btl, 2	15.7	R15
Btl, 6	20.9	R20
Bt2.0	26.2	R25
Bt2.4	31.4	RZ0
Bt2.8	36.7	R35
Bt3.2	41.9	R40
Bt3.6	47.2	R45
Bt4.0	52.4	R50

We can cite the Burj Khalifa skyscraper completed in Dubai (UAE) in 2010 as proof of the strength and reliability of structures made of concrete and reinforced concrete compared to poplar . This building is currently the tallest man-made structure, its height is 828 meters (Fig. 32).

For the construction of Burj Khalifa, a special brand of concrete was developed and designed to withstand temperatures of 50 C for a long time.

We can learn the uniqueness of this giant structure, which has no other similarities in the world, from its main characteristics: the total height of the metal spire is 828 m, the height of the reinforced concrete building is 643.3 m, the number of floors is 164, the total area is 344,000 m^2 .

The construction of the skyscraper started in 2004, and 1-2 floors were built per week. Approximately 320,000 m^3 of concrete and more than 60,000 tons of poplar reinforcement were used for its construction.

170,000 m^3 of concrete with a compressive strength of 80 MPa was used for concreting the foundation and structure of the building.

Construction works were carried out continuously in 2 shifts of 12 hours a day using the most advanced modern technologies. High-strength concrete was delivered

to a height of 611 m using concrete pumps. This is still the world record. Unmolding of monolithic constructions was done every 10 hours. These indicators were realized due to the use of modern concrete modifiers.

Burj Khalifa is one of the great achievements of architecture and engineering thinking, and has undoubtedly taken a special place in history as one of the most daring construction projects. Obviously, this structure will not retain its leadership in terms of height for a long time, because it is unlikely that it will give way to another bold and spectacular project.

Currently, there are several such projects.

We can cite the following objects, which are planned to be built in the future:

Concrete with wollastonite aggregates

The abundance of mineral resources in the mountainous regions of our republic requires the construction of construction material production enterprises in places close to these regions and the extensive use of local raw materials and industrial waste. This, in turn, leads to an improvement in the quality of construction work and a decrease in cost.

In recent years, the building materials industry of our country has been producing polymer materials and polymer concretes, glass plastics, silicate materials, lightweight and ultra-light concretes, high-strength pressed concrete and reinforced concrete products with the help of high technologies. Wollastonite is one of the new raw materials widely used in the construction industry. It is widely used in the construction industry for ceramics, various paints, pigments, asbestos-cement products, cement industry, etc. The possibility of using wollastonite raw materials as small and large aggregates for concrete (which mainly involves the use of wollastonite wastes used in the ceramic and other manufacturing industries) has been explored by scientists. Its reserves are widely distributed in the Central Asian region, including many deposits in our republic.

The color of wollastonite is gray, white or reddish white, sometimes red. There is also a colorless, completely transparent type. The luster is like glass, and it shines like mother-of-pearl on the surface of the connection plane.

It is known that wollastonite can be used as a mineral filler in the production of cement, and as a coarse and fine aggregate for the preparation of concrete. Wollastonite powder added to cement clinker as a mineral additive significantly improves its physical and mechanical properties. That is, such cements are less deformable, resistant to the effects of the external environment, resistant to cold and have other properties. Also, high-strength concrete can be obtained as a result of the use of fractionated wollastonite sand and limestone as aggregates for concrete. Because the materials made of wollastonite masses dry quickly due to the wollastonite content having a needle-like (woolly) structure (shape), it achieves a very high strength bond with other components (cement, sand, etc.). Also, the volume of wollastonite is almost solid and has a number of properties such as heat and cold resistance. Cement consumption is significantly saved in wollastonite concrete, while obtaining pressed concrete of the same strength. This, in turn, leads to economic savings.

Wollastonite-based concretes have high bending and shear strength. Concrete and reinforced concrete structures that can withstand the dry and hot climatic conditions of our Republic can be produced from such strong concrete. Raw materials for wollastonite concrete are not brought from separate mines, in which secondary raw material - wollastonite, which is removed as industrial waste - is used.

The chemical formula of pure wollastonite is $CaSiO_3 = Ca_3[SiO_3O_2]$ (calcium silicate), and its chemical composition contains 48.3% SaO and 51.7% SiO_2. It is also found that it contains up to 9% other minerals (iron, sodium, magnesium, aluminum oxides and other impurities). Due to the needle-like structure of individual chains, the wollastonite crystals do not cover the needle-like structure of opsi even when it is crushed. The high strength of quartz crystals ensures the hardness of this mineral.

Raw materials of wollastonite are mainly formed in solidified limestones or igneous rocks with crystallized calcite garnets, gibberoids and minerals such as feldspar, dioxide, vesuvian, or in the form of a separate mass.

Because wollastonite has a needle-like structure, it is mainly used as a microreinforcing aggregate. There are varieties of wollastonite fibers used for industry with an average length of 200 to 20 μm. Its microneedle structure is shown in Fig. 36

One of the main reasons for the use of wollastonite raw material as a mineral aggregate is the needle-like (fibrous) structure of its natural crystals, which remains unchanged even when it is crushed and turned into a final product (raw material). The main characteristic of anisotropic wollastonite particles is determined by the ratio of long fibers to the width of these fibers.

Microneedle structure of wollastonite
(magnified 1700 times).

It is known that in the production industry of concrete and reinforced concrete products, as well as in the performance of individual concrete works, improving their quality, predicting long-term and aggressive environment resistance, relatively saving cement consumption is one of the urgent problems of today.

The structure of wollastonite raw material is a highly bonded polymeric silicate. Such a bond is usually very difficult to break. Much better results can be achieved if wollastonite is autoclaved (high temperature and pressure of a vacuum) for use as a binder mineral. In the cement production industry, it is allowed to add various active mineral additives to its composition. In most cases, since such coatings are expensive, the cost of cement increases. The inclusion of wollastonite in the composition of cement as a mineral additive improves its construction and technical properties.

The conclusion based on the conducted experiments is that concretes obtained on the basis of wollastonite raw materials are very important for the economy. In particular, preparation of strong and durable concrete and reinforced concrete constructions, production of lightweight concrete; it is possible to sharply reduce the consumption of cement and other materials, as well as reduce the total cost of construction works.

Lightweight concrete

The disadvantage of ordinary concrete, among other disadvantages, is its high average density and relatively high thermal conductivity. These disadvantages are reduced when the density of concrete is reduced.

In surface construction, ρthe ratio of the specific weight of the structure " " to the total load "q" is approximately 0.5 to 0.7, and even 0.85 in the case of large arched roofs. When the density of concrete ρis 1600 kg/m³, its specific weight is reduced by 2/3 compared to normal concrete. The total load q is reduced by about 20-25%, ρand the /q ratio is between 0.4 and 0.75.

When ordinary concrete is used in surface construction, due to its high thermal conductivity, walls, roofs and roofs can usually be covered only with a copper layer, and with a special heat insulation layer. Such a copp layered structure creates construction-physical difficulties, which can be avoided by using lightweight concrete.

Light concretes are divided into the following types in Germany, depending on their average density:

- 2100-2000 kg/m³ - ordinary lightweight concrete;
- 2000-1300 kg/m³ - light structural concrete, compressive strength higher than 5 Mpa;
- 1300-800 kg/m³ - lightweight heat-insulated structural concrete, compressive strength higher than 3.5 Mpa and thermal conductivity lower than 0.75 W/mK;
- 800-250 kg/m³ - very light concrete, compressive strength less than 0.5 Mpa and thermal conductivity less than 0.30 W/mK.

Figure 38 shows how the compressive strength of lightweight concrete depends on the volume density and the increase in porosity, as well as this dependence is determined by the type of lightweight concrete. For example, a decrease in compressive strength up to 5 Mpa can occur even at a pressure of 1700 kg/m³, but only at a pressure of 600 kg/m³.

Options for obtaining lightweight concrete

In lightweight concrete, gpovacity can be created in different ways:

- due to the bulkiness of the aggregates: the solid structure of ordinary concrete is maintained, the ordinary dense aggregate is mixed with the lightweight gpovac aggregate;
- due to the porosity of the matrices: the matrix of the binder swells or foams;
- due to the gpovacity of the aggregate: the closed structure (structure) becomes gpovac due to the decrease in the amount of small aggregate and matrices.

In addition, the estimation of the g-vacancy of the accumulator can be combined with the g-vacancy of the matrices or the g-vacancy of the accumulator (Fig. 39).

Thermal conductivity directly depends on density. However, it should also be taken into account that crystals have a greater heat transfer capacity compared to amorphous materials, and it is more convenient to cover small-grained pozzolans than to cover quartz sand. Table 4 lists the thermal conductivity values of the DIN 4-108 (Part 4) standard.

Figure 39 shows some properties of different groups of ordinary lightweight concrete with different lightweight aggregates. Table 5 lists the main properties of lightweight concretes, their lightness is achieved due to the porosity of the aggregate, and they are aggregated with an average cost-effective amount of cement and are made without additives in the aggregate.

Figure 40 shows the relationship between average density (r) and compressive strength (R) of structural lightweight concrete with 28-day gpovac filler.

4 - table

Thermal conductivity of lightweight concrete made with ordinary fillers (in the case of Germany)

Density, kg/m³	Calculated values of thermal conductivity, W/μK		
	Light filler without quartz sand	Only pumice stone	Only expanded clay
500	-	0.15	0.18
600	0.22	0.18	0.20
700	0.26	0.20	0.23
800	0.28	0.24	0.26
900	-	0.27	0.30
1000	0.26	0.32	0.35
1200	0.46	0.44	0.46
1400	0.57	-	-
1600	0.75	-	-
1800	0.92	-	-
2000	1.2	-	-

A special type of aggregate-dependent concrete is concrete with wood aggregates, in which the aggregate is wood chips or fibers (most often, this is wood from softwood, as well as wood chips as waste). In order to protect the wood from rotting, as well as to protect it from fungi and insects, as well as to prevent the negative effect of wood components on the strength of cement stone, wood chips are pre-treated with chemical preparations (for example, liquid glass) or mineralized with a cement binder.

The compressive strength of wood chip aggregate concrete is about 2 MPa when the density is increased to 1000 kg/m ^{3} · Its penetration, depending on the density of wood chips, is very high, reaching values of 6 mm/m. However, since this concrete is mainly used in the production of ready-made products, in the built structure there is a slight penetration due to its age.

It is used for the production of sawn, wood chip concrete as filler, formwork blocks with concrete filling, strips, as well as for the production of large-sized facade plates and reinforced cover plates. In them, it is necessary to protect the fittings with anti-corrosion agents and a simple compound coating.

Thermal expansion

The coefficient of thermal expansion of expanded shale and expanded clay - Lt is much lower, from 4 ·10 $^{-6}$ to 6 ·10 $^{-6}$ /K. The coefficient of thermal expansion of

light concrete with a closed structure is from ·5 ·10 $^{-6}$ to 12 ·10 $^{-6}$ /K (on average ^{8} 10 $^{-6}$ /K). Therefore, the calculated value according to DIN 4219 standard is about 2 ·10 $^{-6}$ /K lower than that of ordinary concrete. Lt=6 ·10 $^{-6}$ /K can be taken for lightweight concrete with foam, gpovac glass and grain.

Table 5

Lightweight concrete classes and coating (in the case of Germany)

Concrete group	Durability class	Nominal strength, Mpa	Series strength, Mpa	Coverage	
Lightweight concrete V I [1]	LB 8 LB 10 LB 15	8.0 15	11 18	Only for unreinforced building elements. As lightweight reinforced concrete only for walls according to DIN 1045, 1278, Chapter 25.5.1 and only for elements of facades and paronets that are sensitive to specific loads and uplift of walls Unreinforced lightweight concrete and lightweight reinforced concrete	Only for mainly static loads
	LB25 [2]	25	29	Unreinforced lightweight concrete, lightweight reinforced concrete, prestressed lightweight concrete	
Lightweight concrete V II	LB35 LB45 LB55 [3]				Also, in static loads that are not overloaded

1) Validity control is always necessary.

2) Preparation and inspection as VII in the case of initial lightweight concrete.

3) A permit is required on a case-by-case basis or a permit is required in accordance with building control guidelines.

Thermal conductivity

Thermal conductivity primarily depends on the thickness and density of concrete. In lightweight concrete, the inclusion of quartz sand at the same density plays an important role, because crystalline quartz conducts heat better than light aggregate, which is more amorphous: for every 10 volume percent inclusion of quartz sand in lightweight aggregate, the thermal conductivity of concrete increases from about 6% (expanded shale) to 12%. (keramsite) increases, and vice versa, with the help of amorphous inclusions (trass, ash, thermosite and slag), the thermal conductivity can be increased by approximately as much.

The DIN 1048 (Part 4) standard gives the following calculated values for the thermal conductivity of lightweight concrete with a closed structure, which increases by 20% when quartz sand is added (Table 6):

6 - table

Lightweight concrete density and thermal conductivity coefficient as an example of the connection between the two countries (the German experience).

Average density of concrete, kg/m³	Thermal conductivity, W/(m · K)
800	0.39
900	0.44
1000	0.49
1100	0.55
1200	0.62
1300	0.70
1400	0.79
1500	0.89
1600	1.0
1800	1.3
2000	1.6

Due to its good heat-insulating properties, special heat-insulating layers can be dispensed with in the construction of lightweight concrete structures. The advantages of low thermal conductivity have also been shown in steaming, winter construction and yongpin fall. On the other hand, there is a risk of warping due to a

very high temperature difference between the outer and inner sides in case of strong heat radiation (for example, in the case of cover plates).

Economic efficiency and reimbursement

Solar lightweight aggregates are inflated at high temperatures after the raw material is carefully prepared and then often transported over long distances. However, their higher cost compared to natural aggregates can be offset by the direct and indirect advantages of structural lightweight concrete. In favorable conditions, even savings are possible.

Direct benefits:

- The specific weight of construction elements is quite low, which is important when the loading from traffic is not very high (roofs, pedestrian walkways);
- The weight of transportation and assembly is not so great, thanks to which it is possible to transport large ready-made construction elements, use trucks and cranes with a smaller load capacity;
- It has better thermal insulation;
- Thermal expansion is low;
- Due to the relatively low modulus of elasticity, it has good damping in penetrations and earthquakes.

Indirect benefits:

- the size of the height of construction structures and the length of arches;
- low consumption of poplat;
- the dimensions of the structural elements located below are small;
- small dimensions of the foundation, saving piles and eliminating differences in access;
- ease of concreting in winter due to slow absorption of heat of hydration;
- high optical tolerance;
- less horizontal loads when the ground moves.

more convenient options for covering solar light heaters arise:

- Realization of surface constructions where ordinary concrete is very heavy;
- High-rise buildings built above 70 floors using lightweight concrete structures;
- Pedestrian copiers due to the favorable ratio of "Specific gravity total load";
- The main part of the three-arched, large-arched coppice;
- Pre-strengthened reinforcement belts of coppice;
- Screw couplings;
- Suspended roofs;
- Consoles with a large length of the outlet;
- Offshore structures such as floating derricks or drilling platforms for offshore drilling;
- Floating installations or vehicles such as liquid gas tankers, floating docks of pre-reinforced lightweight concrete;
- Unfavorable conditions on the ground;
- With large ready-made elements, not too big transport and assembly weight;
- Building churches due to good thermal insulation properties;
- Decorative concrete console plates with filler, parapet walls, window arches and eaves to prevent thermal shocks;
- In order to stabilize the swelling of the building element from the side of the house, it should have a ribbed construction.

However, along with these advantages, there are also the following **disadvantages** :

- High additional costs;
- In some cases, high consumption of cement;
- Strong deformations;
- Complications in the transfer of concrete mixture;

- Low resistance to bending and shearing, and therefore the need for large shear reinforcement;
- Smallness of strength in separation areas;
- Much greater care is required in estimating production and quality.

In the construction of each structure, it is necessary to carefully study the advantages and disadvantages of the technology, to evaluate the cost-effectiveness of the construction method. When building on the ground, it is often possible to save money only in the construction of multi-story houses. In order to take full advantage of economic and technical advantages, it is often necessary to develop completely new structural and assembly systems. Some construction issues can be implemented only with the help of such systems.

Ultralight concrete

In bulk lightweight concrete, the porosity is estimated only with a lightweight aggregate and a very porous matrix. When the density of the matrix is too high and the amount of light aggregate is too high, under compressive loads, the failure (erosion) of concrete is caused not only by the expansion of the concrete, but mainly by the lack of strength of the walls. When transverse expansion is restrained, different conditions occur in the restraint zone than for other concretes. Therefore, it is not possible to cover the calculation coefficients used for ordinary concrete for samples of different sizes and shapes. A change in the type of concrete structure also affects the strength and deformation, in which the viscosity and fineness of the main mass play a major role. Figures 43, 44 show the use of lightweight concrete in construction and their production technology.

3 - Lecture _ _	**Plastic armature made of mineral and silicate fiber. Basalt and polypropylene fibers**

(lecture-2 hours)

1.1. It is a technolo gy to conduct a lecture

Study time: 2 hours	Number of students: 50
Training form	Informative lecture
Lecture plan	1. Plastic fittings made of mineral and silicate fiber . 2. Production of composite fittings . 3. Bazalgt and 'oli'r'ilen fibers.
The purpose of the training session: to acquaint students with information about composite fittings .	
educational tasks:	*Learning outcomes:*
Classification of prestressed structures into classes gives information about.	In the lecture, they understand the importance and essence of technology.
It provides information on the division of the tensioned armature into classes according to the "rinse" of operation.	They get acquainted with the history of production of prestressed reinforced concrete
It provides information on the division into classes according to the method of preparation.	They can explain the methods of weighing the reinforcement .
Teaching tools	Lecture text, blackboard, computer, projector, slides.
Teaching methods	Informative lecture, blitz poll, brainstorming,
Teaching forms	Work in a team.
Teaching environment	An audience that can be estimated by technical means, and the method of working in groups can be applied.
Monitoring and evaluation	Oral questions.

Technological map of the subject of compact fittings .

Work steps	The content of the teacher's activity	The content of the listener's activity
Stage 1 Introduction to the topic (10 min)	1.1. Explains the topic, plan and results of educational activities. 1.2. Asks questions to enliven the topic. (Appendix 1).	They listen. They answer questions.
Stage 2. Main section (60 min)	2.1. Gives a lecture (Appendix 2). 2.2. Asks questions to strengthen the lecture. (Appendix 3)	They listen and write. They listen and answer.
Stage 3. Finisher (10 min)	3.1. Includes concluding remarks on the exercise. 3.2. He asks questions to prepare for the next topic. (Appendix 4).	They ask questions. They listen and write. They write.

Basalt (meaning iron in Latin and Hebrew) is a stony rock. Basalt is a dark dense igneous rock. Previously, it was studied by adding it to other groups of superficially similar rocks. The rocks of this group are trapps, which are later divided into dollerite, anamesite and basalt. According to its chemical composition, it belongs to new rocks with a basalt base, low silicic acid content of 42-55%. Basalt rocks are used in the production of basalt fibers. The average chemical composition of basalt is as follows. Under the influence of atmospheric factors such as water and carbonate, basalt cracks and pores form a white crust. If the decomposed basalt products are not washed away by water, then during the decomposition process, they decay to a certain depth and form a homogeneous mass called a basalt bath. k or turns into a mass of brown clay.

Synonyms are anamosite, variolite, hyalomelan, stolbchan, trapp.

Basalt rock.

Basalts are formed by partial liquefaction of mantle rocks lertzolite, gratsburgite, wehrlite, etc. The composition of liquefaction depends on the chemical and mineralogical composition of the protolith, the physicochemical conditions of liquefaction, the degree of liquefaction, and the mechanisms of liquefaction flow.

Basalts are divided into the following types by non-dynamic rock:

- Corresponding mid-ocean ridge basalts
- Active or active continental margin basalts
- Basalts in the inner plates can be divided into continental and oceanic
- Eruption of basalts in the mid-ocean ridges is an important process in terms of mass in the earth's crust.

Basalt is one of the most common natural rocks, a volcanic rock that can be found between layers of lava.

Its rich fossils are located in India, USA and Hawaiian Islands. The most famous basalt deposits are volcanoes located in Kamchatka and the Kuril Islands, Bezuvii and Etna.

This basalt stone has black dark grayish or greenish black colors. The basis of its composition consists of augite and feldspar. The density of the stone is 2530-2970

kg/m. Water absorption ranges from 0.25% to 10.2%. Poisson's coefficient is 0.20-0.25. Relative heat capacity at 0 C is 0.85. The melting temperature can be 1100-1250 C, in some samples even up to 1450 C. The resistance is 60-400 Mpa.

Fiber properties. Materials based on basalt fibers have the following important properties: porosity, temperature resistance, vapor permeability and chemical environment resistance.

The porosity of basalt fibers is 70% or more by volume. If the pores of the material are filled with air, basalt with such porosity has a low thermal conductivity.

Temperature resistance is one of the important properties of heat preservation materials, especially used to preserve industrial equipment operating at high temperatures.

The temperature resistance of materials is characterized by the technical temperature of application, through which the material can be used without changing its technical properties.

Vapor permeability refers to the ability of the material to transmit water vapor through its pores. The presence of basalt fibrous pores allows air to pass in the same amount as steam. Due to such vapor permeability, such materials are often always dry.

Steam condensate is mainly observed in the next colder layer. **Chemical tolerance.** Basalt fibers have good resistance to organic substances (oil, solvent, etc.), as well as alkali and acids.

Chemical and mineralogical composition of basalt:

- volcanic glass
- plagioclase microliths
- titanomagnetate
- magnetate and clinopyroxenes

The mineral structure is profiled cotton glass or solid crystalline aphid. The first type of rocks is distinguished by the presence of small inclusions of black pyroxene prisms and isometric crystals of yellow swamp-colored olivine. Such spikes can occupy four parts of the entire mass.

In addition, basalt can contain hornblende glass (rovaya obmanka) and orthopyroxene. The most common accessory mineral is apatite.

Basalt is mainly mined from volcanic lava flows. Excavated pieces from the upper part are bubbly because steam and gases escaped from the lava during cooling. Later, other minerals begin to accumulate in the resulting pores, including the common prenite zeolite calcium and copper.

Basalt types.

Basalt types differ from each other in various indicators. First of all, it differs in color and structure. The most famous commercial variety has the name "Bazaltina". This material was developed in Italy and was mined near the country's capital and used mainly for architectural purposes since Roman times. Its strength is similar to that of granite, and its finish is similar to that of limestone. After setting the stones, the color intensity is preserved for a long time. Therefore, the price can be twice as much as other types.

Another type is "Asiatic", which is dark gray and moderately priced. It can be widely used for design and architectural purposes.

"Mauritanian" green basalt has a dark green color with various sprinkles, which gives the stone its original appearance and retains all its physical and mechanical characteristics. Only the indicators of hardness and cold tolerance are somewhat lower.

"Night basalt" is imported from China. Its color is smoky gray or black. It is recognized as the hardest and most durable and the most frost-resistant among other minerals. This mineral has protection against the negative effects of the atmosphere.

Black basalt.

Black basalt is one of the most popular types of stone, and it is also called classic. Its scope of application is wide, it is the creation of columns and walls, stairs and walkways, water bodies, edging and patios. The universal color of these materials is rare, and there are other color options, smoky green, dark gray. There is no need to look for an alternative solution for what quality and description when choosing building materials. This is first:

1. resilience
2. long-term durability
3. ecological (in nature)
4. heat storage property
5. sound storage property

Therefore, basalt slabs can perfectly control the noise level in public institutions and residences. Not all of these improve the appearance compared to other species. The qualities of heat preservation and noise absorption make these building materials ahead of other stones. If we talk about the chemical and fire resistance of this rock, it should be noted that it is not equal to basalt stones. Basalt stone can withstand a temperature of 1500 C. The last one is the most important quality, taking into account the ecological nature of the present time. It is for this reason that the use of basalt slabs and materials of properties is more than 80% in the construction process.

Application. Basalt fibers are used in heat and sound insulation and fire protection in residential and business buildings and bathrooms, saunas, household services and other facilities, heat insulation in large-diameter pipes in power units, heat insulation in household gas and electric stoves, cooking cabinets, etc., from this stone ready-made building materials are widely used in construction because they have:

- abrasion resistance
- to the effect of alkali and acids
- strength of heat and sound absorption insulation
- good heat resistance and fire resistance indicators
- high dielectric strength
- long term ownership
- vapor permeability
- the most important is ecological (naturalness)

As this mineral building material, mineral wool is used as fillers for concrete and stone laying

4 - Lecture _ _	**Continuous preparation of reinforced concrete structures on long stands** .

(lecture-2 hours)

1.1. It is a technolo gy to conduct a lecture

Study time: 2 hours	Number of students: 50
Training form	Informative lecture
Lecture plan	1. Technical characteristics of production of products by the stand method. 2. Location of lines. 3. Time spent on basic technological operations.
The purpose of the training session: To acquaint the students with the information on continuous casting of reinforced concrete structures on long stands .	
educational tasks:	*Learning outcomes:*
Technical characteristics of production of products by the stand method. gives information about.	Technical characteristics of production of products by the stand method. they understand the essence.
Provides information about the location of lines .	They get acquainted with the information about the location of the lines
Provides information on the time spent on the main technological operations.	They can explain the time spent on basic technological operations.
Teaching tools	Lecture text, blackboard, computer, projector, slides.
Teaching methods	Informative lecture, blitz survey, cluster
Teaching forms	Work in a team.
Teaching environment	An audience that can be estimated by technical means, and the method of working in groups can be applied.
Monitoring and evaluation	Oral questions.

Continuous molding of reinforced concrete structures on long stands technological map of the topic.

Work steps	The content of the teacher's activity	The content of the listener's activity
Stage 1 Introduction to the topic (10 min)	1.1. Explains the topic, plan and results of educational activities. 1.2. Asks questions to enliven the topic. (Appendix 1).	They listen. They answer questions. They listen.
Stage 2. Main section (60 min)	2.1. Gives a lecture (Appendix 2). 2.2. Asks questions to strengthen the lecture. (Appendix 3)	They listen and write. They listen and answer.
Stage 3. Finisher (10 min)	3.1. Includes concluding remarks on the exercise. 3.2. He asks questions to prepare for the next topic. (Appendix 4).	They ask questions. They listen and write. They write.

5 - Lecture _ _	**Classification of chemical additives for concrete and mixtures**

(lecture-2 hours)

1.1. It is a technolo gy to conduct a lecture

Study time: 2 hours	Number of students: 50
Training form	Informative lecture
Lecture plan	1. Classification of chemical additives for concrete and mixtures. 2. Benefits of using supplements. 3. Additions _ _ separately classification of groups distortions
The purpose of the training session: To familiarize with information on the classification of chemical additives for concrete and mixtures .	
educational tasks:	*Learning outcomes:*
Provides information about aggregates used in concrete preparation.	They get acquainted with information about fillers used in concrete preparation .
Provides information about water used for concrete preparation	They get acquainted with information about water used for concrete preparation
Provides information about chemical additives used for concrete preparation	They can explain about chemical additives used for concrete preparation.
Teaching tools	Lecture text, blackboard, computer, projector, slides.
Teaching methods	Informative lecture, blitz survey, cluster
Teaching forms	Work in a team.
Teaching environment	Estimated audience by technical means.
Monitoring and evaluation	Oral questions.

of classification of chemical additives for concretes and mixtures .

Work steps	The content of the teacher's activity	The content of the listener's activity
Stage 1 Introduction to the topic (10 min)	1.1. Explains the topic, plan and results of educational activities. 1.2. Asks questions to enliven the topic. (Appendix 1). 1.3. Activates the known concepts of the topic in a cluster method. (Appendix 2).	They listen. They answer questions. They listen.
Stage 2. Main section (60 min)	2.1. Gives a lecture (Appendix 3). 2.2. Asks questions to strengthen the lecture. (Appendix 4)	They listen and write. They listen and answer.
Stage 3. Finisher (10 min)	3.1. Makes final conclusions on training. 3.2. Gives a list of literature to strengthen the topic 3.2. He asks questions to prepare for the next topic. (Appendix 6).	They ask questions. They listen and write. They write. They write.

Classification of chemical additives for concrete and mixtures

DRY BUILDING COMPOUNDS

Dry construction mixes are a mass consisting of cop components, in addition to mineral binders and aggregates, their composition includes a complex of chemical additives to control the hardness and strength of the mineral binder, to predict that the mixture will achieve the necessary physical and mechanical properties after hardening.

Currently, construction work cannot be imagined without dry construction mixes, because they are prepared in factory conditions, depending on the type of mixture and the place of use, and the proportions of all components are precisely calculated. Lime, gypsum, or cement are used as the basis of dry building mixes. Additives are used to give construction mixtures the necessary properties. polymer additives increase adhesion. It should be noted that high processing is possible with the help of dry construction mixes. In addition, they allow:

- saving time and space, buying and storing all the components, and mixing and preparing complex ingredients;

- the possibility of ordering compositions of any complexity, because dry construction mixes are prepared using modern equipment;

- the closedness of the oven, it is possible to prepare the required amount of mixture at any time;

- the economy of transport costs, as the use of dry construction mixes allows you to avoid always transporting ready-made mixes to the construction site;

- availability of high quality guarantee, accuracy of the mixture recipe due to the exact measurement of the components of the dry composition (the quality of the dry construction mixtures cannot be compared with the quality of the mixtures prepared by weighing the components on the construction site).

The nomenclature of modern dry construction mixes is very wide. The building materials market currently offers various types of plaster, putty, putty, glue, primer, etc.

Currently, about 40 small and large business entrepreneurs are producing dry construction mixes in our republic. In the construction market of Uzbekistan, among the producers of our local dry construction mixes are the companies "Knauf" , "Alimix production", OOO "REAL BUILDING MATERIALS" , OOO Eleron Elit Servis, **Sp BAUpLAST,** private company "Rademus-servis", VENTUM, LLC "New Live Buildis", company "RAHNAMO", MEGAMIX company, OOO "ZEIGER IMpEX", OOO "RAZATA", OOO "BI Vermiculit Group" and others are leading (Fig. 30).

High-quality plaster mixes, putties, primers, cast floors, etc., which meet the requirements of world standards, are produced in automated factories equipped with the most modern equipment.

GOST 31189-2003 specifies the classification of dry construction mixes. Copra dry construction mixes are classified into classes depending on the main function, the type of binder used and the largest particle size of the aggregate.

In addition to their main function, they:

- straightener;
- makeup artist;
- for the floor;
- for repair;
- protector;
- to dial;
- for assembly;
- decorative;
- for waterproofing ;
- for thermal insulation;
- It is divided into the main types, such as for priming.

Dry construction mixes depending on the type of binder used:

- cemented;
- gypsum;
- calcareous;

- polymeric;
- are divided into complex types.

Dry construction mixes are produced centrally in automated factories or special nodes of production bases. Currently, modular factories for the production of highly automated dry building mixes with different productivity have been created and are being successfully used.

The productivity of the plant is primarily determined by the size of the mixer, the number of packaging machines, the number and size of material storage silos.

Dry construction mix plants abroad are designed according to a vertical scheme.

In general, the technological process of production of dry construction mixes consists of the following main operations (Fig. 31):

Binders (cement, lime, gypsum) are stored in silos. The sand is transferred from the stack-type warehouse (1) to the drying drum (4) through a system of belt conveyors (2) and an estimator (3) along the underground gallery. Quartz sand drying is dried in a rotating drying drum at a temperature of 550-600 $^{\circ}C$. The residual moisture content of sand after drying should not exceed 0.1-0.2%. After the sand has been dried, it is sifted in vibro sieves (5) and divided into necessary fractions. Sand is usually divided into the following fractions: 0.15-0.5; 0.5-1.2; 1.2-3 mm.

Small and large fractions are separated from the specified sizes and sent for processing or storage. Ready fractions of sand are sent to metal silos (6), and each fraction is stored separately.

Small mineral aggregates prepared on site undergo several technological operations before use: storage (14), crushing (16), storage in intermediate bunkers (11, 17), transfer (elevators) (18), softening (13), weighing (8)).

Mineral binders are transferred from intermediate hoppers or warehouses to hoppers (8), and chemical additives are transferred to the hopper (24) of the mixing unit. Automatic measuring systems of components operating according to the given program, mixing pressures of dry building mixes production plants are estimated. Many recipes of dry construction mixes can be stored in computer databases.

The mixing shafts of the components are carried out in a hermetically sealed concrete container (20) placed vertically.

The mixing time is 60 to 180 seconds, depending on the composition of the dry mixture. The finished mixture enters the intermediate hopper (21), from which it is transferred to the packaging machine (23) through a system of conveyors. Dry mixes are automatically weighed to the required weight (20, 30 or 40 kg) using a packing machine and placed in paper bags. It is also planned to place the finished product in polyethylene bags of 2, 3, 5 or 8 kg.

Ready-made bags or packages filled with dry mixture are placed on wooden pallets or special containers (27) with the help of a manipulator and sent to the warehouse of finished products or to the consumer.

MINERAL BINDING SUBSTANCES

When mixed in water, it turns into a plastic paste, gradually thickens, and eventually hardens like a stone. The fine-grained materials are called binder minerals.

The properties of the binder are important for builders in classification. Some binders harden in air, while others harden in both air and water. They are connected to air and hydraulic binders according to this sign.

Air binders only harden in air and retain their strength for a long time under these conditions. This group includes air lime, gypsum, magnesium binders, and liquid glass.

Hydraulic binders harden not only in air, but also in water, maintaining or increasing their strength for a long time. This group includes hydraulic lime, portland cement and its types, clay cement, non-burning alkaline cements, etc.

3.1. portland cement

Portland cement refers to the powdery material obtained by smoothing Portland cement clinker and gypsum together. An active mineral supplement or other supplements may be added during pregnancy.

Gypsum filler is added 3-5% in order to control the setting time of portland cement.

GOST 10178-85 "portland cement and portland cement with slag" , there are types of portland cement without encasement, portland cement with 20% active mineral encasement and portland cement with slag. 20% of copper blast furnace slag or electrothermophosphorus (ETF) slag is added to slag portland cement.

Portland cement and its types It is not wrong to say that it is one of the basic materials of modern construction . Concrete and reinforced concrete buildings are prepared from them for residential , public , industrial and commercial construction . It is used in building construction, hydrotechnical constructions, building construction , construction and irrigation construction .

In our republic, portland cement Navoi, Ohangaron , Bekobad , Kuvasoy cities and Andijan region .

portland cement can be produced in dry, hopl and mixed methods.

Dry production of clinker is technically and economically preferable if the moisture content of the raw materials does not exceed 10-15%, and the chemical composition and physical structure are the same.

3150÷4190 kJ of heat is required to produce 1 kg of clinker in dry method (5900-6700 kJ/kg in hopl method).

In the dry method, after the raw materials are crushed and dried, they are sifted in a ball or other mill until 6-10% of the residue remains in sieve No. 008. The size of the ball mill is 4.2x10 m, two of them are 120-130 t/s gives productivity. Prepared raw materials first pass through cyclone heat exchangers (in which the temperature is 800-850 °C) and fall into the decarbonizer (in which the temperature is 920-950 °C) and then sent to the steam room.

The dimensions of such rotary humdons are 5x75 m or 7x95 m boplib daily productivity 1600-3000 is equal to t .

This method of clinker production is widely used in Japan, Germany, France, Italy and other developed countries. A chain of Navoi and Bekobod cement factories in Uzbekistan produces cement in this way. Figure 25 shows the technological system of dry clinker production.

Hopl production of cement is more common in Russia and the USA.

the main properties of portland cement, including its activity, hardening speed, etc., depend not only on the chemical and mineralogical composition of the clinker, the structure and size of the crystals of alite, belite and other minerals, on the inclusions, as well as on the softness and granularity of its particles.

The size of cement particles ranges from 5-10 to 30-40 μm, and their softness is 0.2; It is carried out by sieving on 0.08 and 0.06 mm sieves or by determining the relative surface area of the particles. Ordinary portland cement has 5-8% residual mass on digital sieve No. 008 or a specific surface area of 250-300 m^2/kg, and accelerated portland cement has 2-4% residual on sieve No. 008 and a specific surface area of 300-450 m^2/kg. If the specific surface area of the particles is increased to 400-500 m^2/kg, the strength increases, but the cold resistance decreases, if the specific surface area is increased to 700-800 m^2/kg, the strength also decreases.

Ball mills are mainly used for grinding clinker (Fig. 26). Grinding of portland cement clinker in the mill can be done in open or closed way. 4x13.5 at cement factories; 3.2x15; Mills of 2.6x13 m and other sizes are used. The mills are tied in two or three layers with holed tops along the length. Poplat balls and cylinders (tsilgppebs) are placed in each boplim. Large balls (diameter 60-120 mm) are placed in the first boplim, 40-60 mm in the second boplim, and 20-30 mm balls or tsilgppebs (20-25 mm) in the third. The amount of balloons is 26-32% of the first volume, 26-30% of the second, and 24-30% of the third. The inner part of the mill is covered with special chrome-manganese poplat or rubber resistant to friction.

Alkaline cement without burning

The history of the development of the science of binders shows that mineral binders are mainly based on calcium, and some binders are based on magnesium. These two chemical elements are located in the second column of Mendeleev's periodic system, the column of alkaline earth metals. In this case, base metals are placed in the first column , and amphoteric metals are placed in the next column . The analysis of the types of binders , their composition, production technology , coating , and new compounds in the produced sand stone shows that Base metals have stronger bonding properties than base metals . _ _ _ _ _ _ _ This once again

shows the greatness of Mendeleev 's periodic system , because first there are metals with high bonding properties , then there are metals with relatively low bonding properties . _ _ _ metals , followed by metals that produce amphoteric oxides .

the oxides and salts of the old metals have high melting properties , they were previously included in the composition of the slags . Later, the work was covered in a small amount as an additive that activates the old metals into the connective tissue . This added alkali accelerates the dissolution of silicon in the gp-cylic binder system , as a result , it did not participate in the formation of new compounds, but came out on the surface of the structure in the form of white salt .

Professor VD is responsible for this issue The third component of the Glukhovsky binding system - new three - component compounds with amphoteric oxide dissolved and alkali metal with high resistance to water damage - alkali metal hydroaluminum compound was created . Thus , 1957 _ _ work in the year _ metals - Sa, Mg, Sr, Alkali metals in the Ba series - Li, Na, K, Rb, Cs it was also found to have binding properties.

Alkaline cement refers to a hydraulic binder obtained on the basis of aluminosilicate and alkaline constituents.

A well-studied type of alkaline cements are slag-alkali binders. In this case, ferrous metal smelting (blast blast furnace slag) and non-ferrous metallurgy - nickel, copper, earthen clay slag, as well as electrothermophosphorus slag filled with waste from the chemical industry are used as aluminosilicate constituents. The qualitative composition of oxides in these slags corresponds to the composition of portland cement and differs quantitatively: the content of CaO in portland cement is higher than in slags, and SiO_2 is less, therefore portland cement hardens under natural conditions, while slags are closed (Table 1).

Table 1

Chemical composition of aluminosilicate components

Name	Amount of oxides in % by mass					
	SiO_2	Al_2O_3	Fe_2O_3 + FeO	CaO	M_0*	M_a**
Blast furnace grain slag	35÷ 39	7÷17	1÷3	35÷49	0.9 ÷1.13	0.16÷0.48
Non-ferrous metallurgical slag	29÷45	6÷12	18÷34	11÷22	0.3÷0.6	0.13÷0.27
Electrothermophosphorus slag	41÷42	2÷4	to 1 up to	44÷46	1.05÷1.13	0.07÷0.08
portland cement clinker	21÷24	4÷8	2÷4	63÷66	~ 3	0.17÷0.39

* *M_0 – base module ($CaO+MgO/SiO_2+Al_2O_3$)*

** *Activity module (Al_2O_3/SiO_2).*

Slag-alkaline cements are obtained by mixing finely ground metallurgical or electrothermophosphorus slag with a water solution of alkaline metal (sodium, potassium, lithium) compounds that create an alkaline environment. If the hygroscopic property of the alkaline agent is low, then these two components are softened together, and the resulting powder is mixed with water.

It is possible to use the oxides and salts of alkali metals in water solution, which create an alkaline environment, as well as chemical waste contained in the composition of these elements, as an alkaline agent.

In order to control the properties of slag-alkaline cement and aggregates obtained from it, mineral or organic additives can be added in the filling or with the mixing liquid.

Slag-alkali cement can be produced in two ways. In the first method, dried and powdered aluminosilicate, alkaline components and additives are combined in a mill. In the second method, the alkaline component is dissolved in separate water and added.

When slag-alkaline cement is mixed with water (if the binder is prepared by the first method) or a solution of the alkaline component in water (if the binder is prepared by the second method), a plastic paste forms and begins to harden gradually. The mineralogical composition of the stone obtained as a result of solidification consists of hydroalumino- and hydroferrosilicates of alkali metals, in addition to low-base hydrosilicates of calcite and calcite. Such mineralogical

composition justifies the fact that slag-alkali cement has high physical and mechanical properties.

The main properties of slag-alkali cement are as follows:

- average bulk density 1000÷1200 kg/cm ^{3} ;
- real density 2.7÷2.9 g/cm ^{3} ;
- softness level 270÷300 m ^{2} /kg;
- water requirement 24÷26%;
- copra grades 300, 400, 500, 600, 700, 800, 900, 1000, 1100, 1200 for the limit of strength in compression and bending;
- marks for cold resistance 50; 100; 200; 300.

One of the main properties of slag-alkali cement is high water resistance.

The main properties listed above justify the areas of use of slag-alkali cement. These cements are used for industrial and civil construction, along with concrete and reinforced concrete, in hydrotechnical structures, construction of roads and other places.

Lecture _ _	**Superplasticizers. Complex additives for concrete and mixtures**

(lecture-2 hours)

1.1. It is a technolo gy to conduct a lecture

Study time: 2 hours	Number of students: 50
Training form	Informative lecture
Lecture plan	1. Su'er'lastificators. 2. Complex additives for concrete and mixtures.
Purpose of training: Su'er'lastificators. Introducing information about complex additives for concrete and mixtures.	
educational tasks:	*Learning outcomes:*
Gives information about questionnaires.	They get acquainted with the information about questionnaires .
Provides information on complex additives for concrete and mixtures	They get acquainted with information about complex additives for concrete and mixtures
Teaching tools	Lecture text, blackboard, computer, projector, slides.
Teaching methods	Informative lecture, blitz survey, cluster
Teaching forms	Work in a team.
Teaching environment	An audience that can be estimated by technical means, and the method of working in groups can be applied.
Monitoring and evaluation	Oral questions.

Technological map of the topic of providing an understanding of materials for the preparation of prestressed structures .

stages	The content of the teacher's activity	The content of the listener's activity
Stage 1 Introduction to the topic (10 min)	1.1. Explains the topic, plan and results of educational activities. 1.2. Asks questions to enliven the topic. (Appendix 1).	They listen. They answer questions. They listen.
Stage 2. Main section (60 min)	2.1. Gives a lecture (Appendix 2). 2.2. Asks questions to strengthen the lecture. (Appendix 3)	They listen and write. They listen and answer.

Суперпластификаторлар. Классификацияси ва таъсир механизми

ГОСТ 24211-2003 бўйича суперпластификаторлар бетон қоришмалари хоссаларини бошқарувчи қўшимчалар турига киради. Бу эса ҳамма синаш вақтларида уларнинг мустаҳкамлигини пасайтирмаган ҳолда, бетон қоришмасини кучли суюлтириш хусусияти билан ифодаланади.

СПлар япон ва немис олимларининг XX асрнинг 70 йилларида илмий изланишлари натижасидир. Бундай қўшимчаларни яратишнинг асосий ғояси асосида бетон қоришмаларини қолипларга механик таъсирдан умуман фойдаланмасдан ёки бундай таъсир даражасини кескин камайтириш ётади.

Суперпластификаторлар деб ҳозирги вақтда махсус синтез йўли билан олинадиган ва оптимал дозировкада кам ҳаракатли бетон қоришмаларига (Кч = 2-4 см) қўшилганда оқувчан ёки юқори ҳаракатланувчи (Кч = 18-24 см) бетон қоришмаланини олиш имконини берувчи органик бирикмаларни атайдилар. Бетоннинг мустаҳкамлиги асос қилиб олинган таркиб асосида тайёрланган бетоннинг мустаҳкамлигига нисбатан паст бўлмаслиги лозим.

Кимёвий таркибига кўра ҳамма суперпластификаторларни шартли равишда тўрт гуруҳга бўлиш мумкин:

– биринчи гуруҳга сульфирланган меламинформальдегид смоласи асосидаги суперпластификаторлар тааллуқлидир;

– иккинчи гуруҳга нафталинсульфокислоталари ва формальдегид поликонденсацияси маҳсулотлари асосидаги қўшимчалар тегишлидир;

– учинчи гуруҳ оксикарбон кислоталари поликонденсацияси маҳсулотларини бириктиради;

– тўртинчи гуруҳга модификацияланган лигносульфонатлар киради;

Бетон қоришмаларини ишлаб чиқаришда кенг қўлланилаладиган суперпластификаторлар ва уларнинг оптимал дозировкалари

Номи	Шартли белгиси	Цемент массасига нисбатан қўшилиш миқдори, %
Сульфирланган меламинформальдегид смолалари	10-03	0,3-0,9
	МФАС	0,3-0,9
	С-3	0,4-1,0
	MELMENT	1,0-2,5
Сульфирланган нафталин-формальдегид смолалари	Полипласт СП-1	0,4-0,8
	Полипласт СП-3	0,4-0,8
	Полипласт СП-ПП	0,4-0,8
	STABIMENT FN	0,4-1,0
	STABIBOND SN	0,4-0,8
	30-03	0,4-0,8
	40-03	0,4-0,8
Модификацияланган лигносульфонатлар	МТС-1	0,4-0,9
	ВИЛ-30	0,3-0,6
	ХДСС-1	0,1-0,5
	ЛСТС	0,1-0,25
	КОД-С	0,2-0,3
	BETOPLAST	0,3-0,5
	STACHEPLAST	0,3-0,5

- Ҳозирги вақтда суперпластификаторларнинг таъсир механизми охиригача аниқланмаган, аммо қуйидаги факторлар аниқланган деб ҳисоблаш мумкин:

-Суперпластификатор молекулалари «суюқлик - қаттиқ жисм» фазалар бўлинишш чегарасидаги сирт тарангилк кучини пасайтиради. Кўпгина сирт фаол моддалар (СФМ) эса «газ-суюқлик» фазалар бўлинишш чегарасидаги сирт таранглик кучини пасайтиради. Суперпластификаторлардан фойдаланилганда бетон қоришмасига ҳаво жалб этилишининг пастлигини шу билан ифодалаш мумкин;

-Суперпластификатор молекулалари боғловчи заррачаларга диспергацияловчи хусусиятига эга. Натижада суперпластификатор иштирокида майда заррачаларнинг миқдори икки марта ортиб кетади ва цементнинг боғловчилик хоссалари ортади;

-Суперпластификаторларнинг таъсир вақти оддий СФМларга нисбатан анча қисқа. Бунинг сабаби суперпластификаторлар молекулалари тузилишининг ўзига хос хусусияти ва молекуляр массасининг катталиги билан боғлиқ;

- кўпгина суперпластификатор қўшимчалар оддий СФМларга нисбатан цемент гидратацияси тезлигига кам таъсир этадилар.

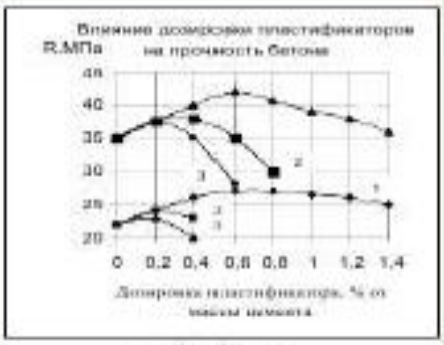


Рис. 2.1.
1-С-3; 2-ЛСТ; 3-УПД

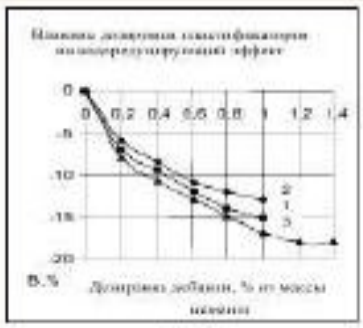
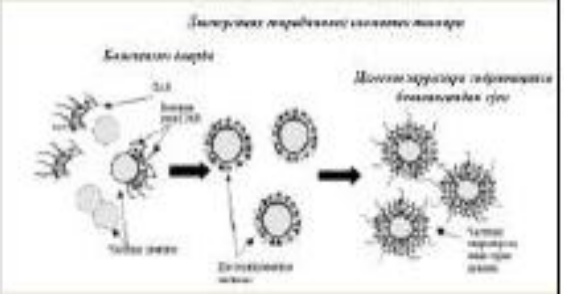


Рис. 2.2.
1-С-3; 2-СМФ; 3-С-3+УПБ

Шундай қилиб, мавжуд фактлардан суперпластификаторларнинг таъсир механизми қаттиқ фаза зарраларининг ички ишқаланишини пасайтириш ва унинг диспергациясига олиб келувчи макромолекулаларнинг боғловчининг фаол марказларида физик адсорбциясидан иборат.

Келгусида тизимда кальций гидроксиди ҳосил бўлиши ва йиғилиши натижасида суперпластификаторнинг функционал гуруҳларининг кальций гидроксиди билан кимёвий ўзаро таъсири рўй беради ва молекулаларнинг нейтралланиши рўй беради.

- Гиперпластификаторлар – бу поликарбоксилат эфирларидир. Тузилишига кўра бу ўланган сополимерладир. Уларнинг фарқи – диспергациялаш (дефлокуляция, агломератларнинг бузилиши, пластиклаш ва бошқ.) электростерик принцип бўйича рўй беради электрстатик + стерик (фазовий) диспергациялаш (майда заррачаларнинг итарилиши) дир.



Турли мақсадлар учун комплекс қўшимчалар. Қўшимчаларнинг тури ва улардан фойдаланиш фусуниями

Комплекс қўшимчалардан фойдаланишнинг сабаби индувидуал қўшимчалар – энг аввало СФМ ва қотишни тезлаштирувчиларнинг ижобий хоссаларидан кўпроқ фойдаланиш ва салбий хоссаларини бартараф этишга интилишга асосланғандир. Қўшимчалар тури ва қўшимчалар миқдорини тўғри танлаш хисобига цемент тоши ва бетоннинг структурасини мақсадли бошқариш, шунингдек физикавий-механик хоссаларини бошқариш имконини беради.

Ҳар қандай алоҳида қўшимчага нисбатан комплекс қўшимчаларнинг асосий афзалликлари:

- таъсирининг полифункционаллиги, яъни бир вақтнинг ўзида бир неча самарага эришиш (мисол учун, ҳаракатланувчанликни ортириш, ҳаво жалб этиш, қоришманинг сув талабчанлигини пасайтириш ва бошк.)
- Қўшимчалик принципи бўйича қандайдир бир самарани ошириш (мисол учун, ҳаво жалб қилиш, қоришманинг сув талабчанлигини пасайтириш ва х.к.);
- композицияга кирувчи алоҳида қўшимчаларнинг кутилмаган оқибатларини нейтраллаштириш (СФМнинг цемент гидратациясини тормозлаш хусусиятини тўхтатиб, бир вақтнинг ўзида қотишни тезлаштирувчи қўшимча қўшиш ва бошк.);
- Турли таркибларга эга цементларга қўшимчалар умумий таъсири самарасини текислаш хусусияти;
- Маҳсулотларга иссиқлик ишлови берилганида бетон қотишини тезлаштириш ва деструктив жараёнларни олдини олиш ёки йўқотиш.

В настоящее время сложились и успешно развиваются четыре основных направления модификации бетона комплексными добавками.

[illegible]

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1. [illegible]	[illegible]
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2. [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

- Суперпластификатор деганда нимани тушунасиз?
- Комплекс қўшимчалар нима?

Кейинги дарсга тайёрланиб келиш учун вазифа

- Замонавий деворбоп материаллари нима?

5 - Lecture _ _	Modern wall materials

(lecture-4 hours)

1.1. Lecture technology _

Study hours: 4 hours	Number of students: 50
Training form	Informative lecture
Lecture plan	1. General information. 2. Wall stone materials, wall stone panels . 3. Multi- layered , wood walls. 4. Monolithic walls. 5. Use of non-removable formwork in the construction of buildings
To familiarize with information about modern wall materials .	
' educational tasks:	*Learning outcomes:*
Devobo introduces general information about materials.	In the lecture, they will learn general information about wall materials
Wall stone materials, wall introduces the rings .	Wall stone materials, wall ' get acquainted with the angels
Blue layer , wood walls provide information.	learn about wooden walls .
Provides information about monolithic walls .	Learn about monolithic walls
Introduces information about the use of non-removable formwork in the construction of buildings	They will learn about the use of non-removable formwork in the construction of buildings
Teaching tools	Lecture text, blackboard, computer , projector, slides.
Teaching methods	Informative lecture, blitz poll, brainstorming,
Teaching forms	Work in a team.
Teaching environment	An audience that can be estimated by technical means, and the method of working in groups can be applied.
Monitoring and evaluation	Oral questions.

Technological map of the theme of providing an understanding of modern wall materials.

Work steps	The content of the teacher's activity	The content of the listener's activity
Stage 1 Introduction to the topic (10 min)	1.1. Explains the topic, plan and results of educational activities. 1.2. Asks questions to enliven the topic. (Appendix 1).	They listen. They answer questions. They listen.
Stage 2. Main section (70 min)	2.1. Gives a lecture (Appendix 2). 2.2. Asks questions to strengthen the lecture. (Appendix 3)	They listen and write. They listen and answer.
Stage 3. Main section (70 min)	3.1. Gives a lecture (Appendix 2). 3.2. Asks questions to strengthen the lecture. (Appendix 3)	They listen and write. They listen and answer.
Step 4. Finisher (10 min)	4.1. Makes final conclusions on training. 4.2. 3.3. He asks questions to prepare for the next topic. (Appendix 4).	They ask questions. They listen and write. They write.

Modern wall materials

Fine ceramics

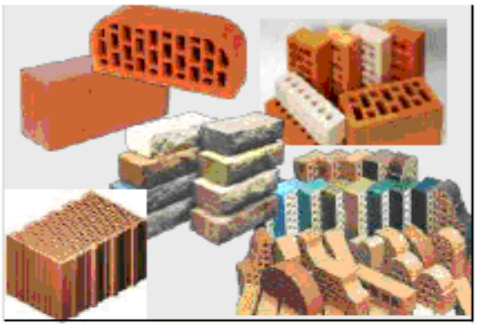
Wall ceramic products make up 50% of wall products used in construction. High-density wall ceramic products (plaster , ceramic stone) are divided into 3 parts:

1. Effective - the density is not more than 1400-1450 kg/m ^{3} , it can hold heat well;
2. Conditionally effective - 1450 - 1600 kg / m ^{3} ;
3. Normal - more than 1600 kg / m ^{3} .

Simple baked gpisht The dimensions should be 250x120x65 mm, the edges should be sharp, clear, and the surface should be smooth and flat. The sides may differ by up to 3 mm .

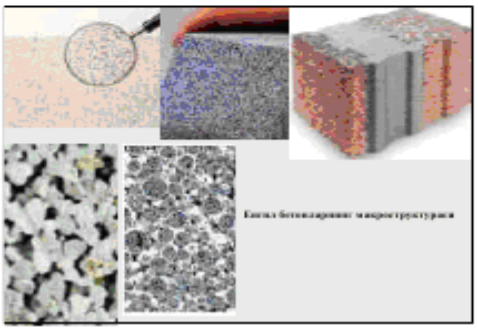
The size of the modular bricks is 250x120x88 mm and they are made of round or top corner holes . gpisht depending on its strength bound to the following brands: 75; 100; 125; 150; 200; 250;

300.



Енгил бетонлар ўртача зичлигига қараб Германияда қуйидаги турларга бўлинади:

- 2100-2000 кг/м³ - оддий енгил бетон;
- 2000-1300 кг/м³ - енгил конструктив бетон, сиқишга мустаҳкамлиги 5 МПа дан юқори;
- 1300-800 кг/м³ - енгил иссиқликдан изоляцияланган конструктив бетон, сиқишга мустаҳкамлиги 3,5 МПа дан юқори ва иссиқлик ўтказувчанлиги 0,75 Вт/мК дан паст;
- 800-250 кг/м³ - жуда енгил бетон, сиқишга мустаҳкамлиги 0,5 МПа ва иссиқлик ўтказувчанлиги 0,30 Вт/мК дан паст.



Енгил бетонларнинг макроструктураси

Оддий тўлдиргичлар билан тайёрланган енгил бетоннинг иссиқ ўтказувчанлиги (Германия миқёсида)

Зичлик, кг/м³	Иссиқлик ўтказувчанликнинг синовий қийматлари, Вт/мК		
	Қисман қумсиз енгил тўлдиргич	Фақат перлит	Фақат керамзит
500	-	0,18	0,18
600	0,22	0,18	0,20
700	0,24	0,20	0,23
800	0,28	0,24	0,26
900	-	0,27	0,30
1000	0,36	0,32	0,35
1200	0,46	0,44	0,46
1400	0,57	-	-
1600	0,75	-	-
1800	0,92	-	-
2000	1,2	-	-

Extraction and processing of natural stone materials

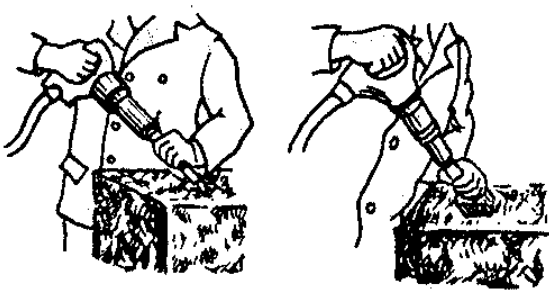
For the production of stone materials and products, it is first necessary to mine and process coal .

Quarrying . _ _ _ Methods of mining rocks used as construction materials depend on their location , strength and hardness , as well as the shape and size of the products to be made . In cases where the rocks are not located very deep or are located close to the surface of the earth , their mining is carried out in an open way . Deep - seated rocks are mined underground in quarries or mines . _

Dense rocks intended for small stone or crushed stone are usually mined by blasting , but this method is used for the production of large-sized slabs and blocks from the rock . It is not recommended because cracks may appear in the rocks. Individual blocks are sawn or broken from the massif with the help of stone shaving and chipping machines , as well as special tools .

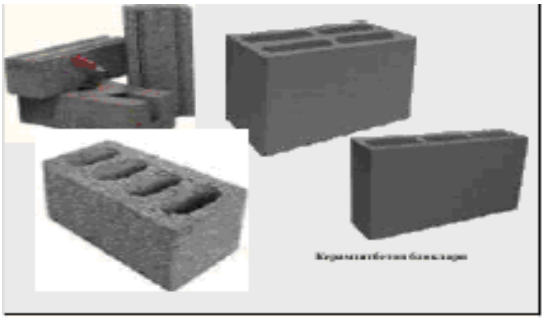
Rocks that can be easily worked , such as tuff and limestone , are mechanized with the help of stone crushers . The cutting elements of the machines consist of a disc saw with transverse and vertical chisels . The rolling stock machine is mounted on a carriage that moves along the rail track. Blocks of the required size and geometric shape are sawn from the massif with the help of disk plates located in three mutually perpendicular planes . When excavating in the open method , the stone pit machine , not built by Galanin, works well. There are also stone sawing machines for sawing large blocks . Grindable rocks (sand, gravel , clay) are mined using single and multi-hole excavators and other machines .

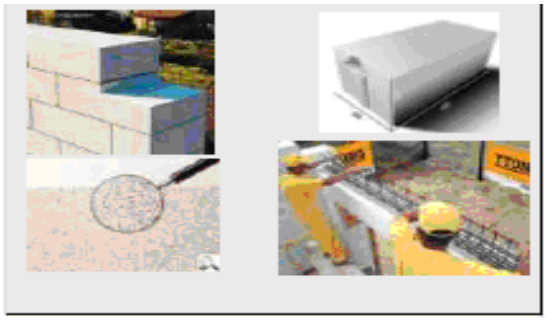
Work on stone . _ As a result of processing the large-sized stones separated from the rock massif, the stone will have the required shape and size, and the upper surface will be in a specified state . Stone is usually mechanized in special factories . _ Paving stone processing is particularly laborious and complex . It includes the following basic steps : sawing stone blocks into slabs and pieces of the required thickness; cutting of plates and pieces in given sizes, profiling and texture decoration , etc. To process the stone , static machine tools of various devices , as well as a portable pneumatic tool (Fig. 3) are used . In small construction

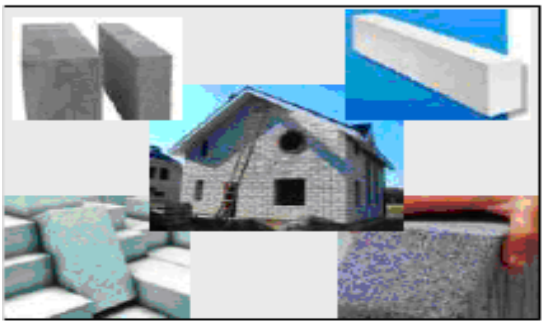


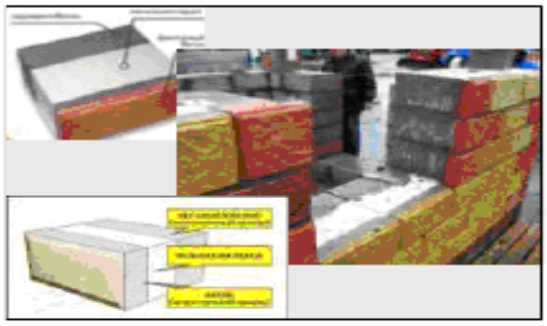
3-rasm.Toshga dastaki pnevmatik asbob bilan ishlov berish

sites , the necessary parts of the details are sharpened when performing coating work on the surface of this tool .









Properties and types of natural stone materials and products

Properties of natural stone materials . Among the various physical and mechanical properties of natural stone materials , density, compressive strength, and heat resistance are distinguished. According to the value of these properties , the quality of materials is evaluated and divided into brands.

Stone materials are divided into heavy (more than 1800 kgG'm 3) and light (less than 1800 kgG'm 3) materials according to their dry density .

The following marks are defined according to the limit of compressive strength: for heavy stone materials - from 10 to 100, and for light stone materials - from -1 to 20.

According to the level of resistance to cold in freezing levels (SCh), stone materials are marked from 10 to 500 marks.

on the level of water resistance (softening coefficient) - 0.6; 0.75; It is divided into groups with indicators of 0.9 and 1.

road surfaces , floors of industrial buildings (abrasion resistance , high corrosion resistance , etc.) . Appearance, color and texture (picture) are of great importance for the natural stone from which the facing plates are made .

rock samples for one or another stone materials and products are selected based on the assessment of their appearance , as well as the conditions of use .

natural stone materials and products. The following types of natural stone materials and products are used in construction , in particular, concrete , wall stones and blocks , facing stones and slabs , roofing tiles and blocks .

In construction, limestone is used in the form of irregularly shaped pieces of rock (broken limestone) or irregular slabs . Excavated concrete is made from sedimentary rocks (limestone , dolomite , sandstone) by blasting , and slabs are made from layered rocks and hammered . it is mined with the help of the mechanisms and parts put into motion . The mass of individual kharsangs varies by 20-40 kg . The limit of compressive strength of hard concrete should be at least 10 MPa, and the softening coefficient should not be lower than 0.75. It should not contain cracks and crumbly layers that reduce construction properties .

Giant stones and blocks are made from limestone , volcanic tuff and other rocks with a density of up to 2200 kgGm3 . _ _ The size of stones intended for manual picking is 390x190x190 mm, and the size of large blocks suitable for mechanized picking is determined based on the strength of the rock and the load-carrying capacity of the cranes . Stones and blocks of the correct geometric shape and required dimensions are usually produced by sawing the stones from the massif with the help of machines ; Stones prepared by breaking and grinding are rarely used. The upper surface of the walls and blocks must meet the requirements of the scenery .

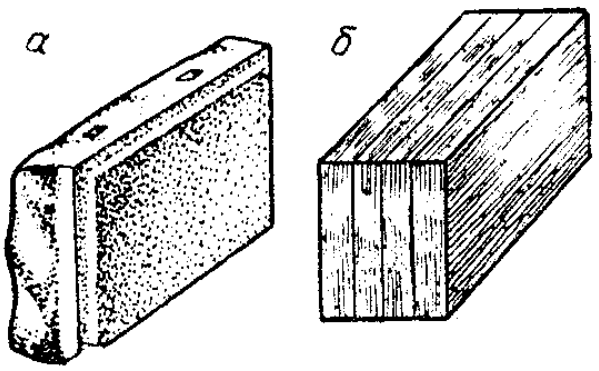


Fig. 4. Sawn (a) and sawn (b) plywood sheets

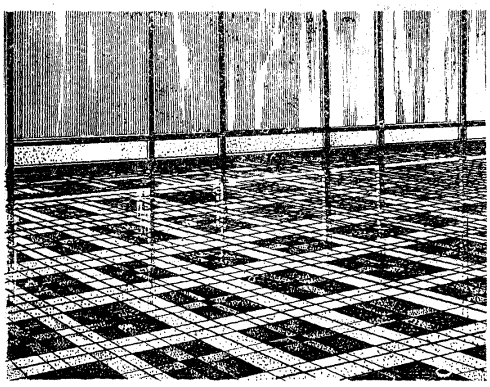


Figure 5. Concrete tiles made from waste marble

compressive strength limit of rocks used for the preparation of blocks and blocks should not be less than 25 MPa, cold resistance should not be less than SCh15, and the softening coefficient should not be less than 0.6.

Paving stones and slabs are sawn and planed (Fig. 4) . Sawn products are usually cheaper and cleaner than planed products , since thick rocks can be sawn to make thinner products without micro - gaps (which occur when stone is cut) .

In the production of marble slabs, a lot of waste is produced , which is used to make clay plaster (Fig. 5) .

In addition to natural stone and facing plates , profiled details, such as plinths, corner details, edged and curved trim details , as well as stair treads , window sills and others are made. .

Methods of transportation, storage and protection of natural stone materials and products

During the transportation and storage of natural stone materials and products, it is necessary to observe measures to exclude mechanical damage, pollution and moisture. Cover plates and other items are not allowed to be thrown during transportation and unloading from vehicles.

During transportation and storage, sawn and planed veneer sheets are fixed on the edge with gaskets, and polished ones are placed in special containers with the right

side facing inward, in which paper is placed between them. Architectural details and window sills are carried in a lattice fixture.

It is recommended to store paving materials made of natural stone in closed warehouses or under shelters, separated by type, and sawn blocks and curbstones laid on wooden pallets in leveled open areas. It should be ensured that water flows out of the warehouse.

In the process of use, stone materials in devices and structures can gradually erode. This process is called weathering, based on its similarity to the decay of rocks on the surface of the earth.

Stone materials can be destroyed as a result of interaction with the surrounding environment, physico-chemical processes, as well as the effect of various plant organisms. The main cause of stone erosion is the action of water, as it enters the cracks and pores of the stone, freezes and expands, and erodes the stone. In addition, as a result of sudden changes in temperature, microcracks appear on the stone surface, which become a source of decay. Various microorganisms and plants settle in the cracks and release organic acids, which in turn erode the rock. Various gases in the air, such as carbon dioxide gas, intensively erode the surface of limestone and marble. The rate of decay of natural stone material depends on the stone's structure, density, surface quality, chemical composition of rock-forming minerals and other details, as well as the intensity of external influences on the stone.

In order to protect natural stone materials, it is necessary to take certain constructive and chemical measures against decay in the devices of buildings and structures. Constructive measures are to ensure that water flows correctly and quickly from the surface of the stone, as well as to create a dense and smooth surface due to grinding and polishing.

Chemical measures involve impregnation of special compositions on the surface of porous stone. These ingredients seal the surface and prevent it from getting wet. Among the existing methods of chemical protection of stone materials, the most effective is fluting, that is, impregnation of fluates (solutions of silicic hydrofluoric acid salts) on the surface layer of porous limestone. Fluates react with calcite $SaSO_3$

and form insoluble compounds on the surface of the stone, which fill all the pores in the surface layer, prevent moisture from entering the material, and at the same time increase its resistance to the effects of the external environment.

In order to improve the quality of coatings made of natural stone materials, they should be covered and impregnated with hydrophobic (water-repellent) compositions, for example, GKJ-94 or GKJ-10 brand solution, as well as the use of polymer materials that form a curtain that prevents moisture from entering the pores of the stone coating. is recommended.

Local natural stone materials

Construction of industrial and residential buildings in the cities of Uzbekistan, due to the extensive use of covering materials, as well as the construction of railways, ordinary brick and ceramic materials could not meet the construction requirements. That's why an amazing material - natural stones - began to be used in construction.

Exploration of natural stone materials necessary for construction is well underway in Uzbekistan. The reserves of mineral resources found so far can meet the construction requirements for several decades.

The rocks of the Mogultov Mountains and the rocks of the Farhad Mountain near the Bekobad area are all black and gray limestone. These limestones can supply cement factories for 100 years.

Limestone deposits can be seen covering the northwest side of the road from Ohangaron to Angren. The limestone layer here is up to 20 meters thick. The thickness of healthy clay soil around this area is up to 10 meters. In addition to these, these valleys also contain opocs, volcanic tuffs, and naturally matured rock (gliege) as natural active ingredients added to Portland cement. Also, such compounds are found in Parkent, Kyzylkiya, Angren region and Ohangaron valley.

Small (sand) and large (gravel) fillers used in the preparation of concrete and reinforced concrete devices are widespread in Uzbekistan. Gravel and sand reserves can be found in the valley of the Chirchik river near Chinoz, in the Syrdarya valley, in the Fergana valley and in other places. In addition to the aforementioned river sands,

ancient coastal sands can also be used for concrete. Such sand deposits are common in the regions near Tashkent and in the Fergana Valley. They are widely distributed as a layer 10-20 meters thick, in the Ohangaron valley as small hills up to the Jilga parking lot, and in the Chirchik valley up to the Barrage parking lot. Sand has been mined from Mays and Darvoza sand mines for almost 15 years. Around the Shorob and Sulyukta coal mines, layers of white sand with a thickness of 20-30 meters have risen to the surface. Our prospectors have also found huge reserves of quartz sand in Kyzylkum deserts.

In Bukhara, Surkhandarya regions, in some regions of Karakalpakstan, in the Fergana valley, there are lands that are covered with barkhan sand.

Apart from these, clayey shale stones are also found in Zyovuddin mountains near Zirabulok village on the left bank of Zarafshan valley, Sultan-Uiz-Dog mountains in Karakalpakstan and in the south of Fergana valley.

Among the natural stone materials that have risen to the surface of the earth, rocks such as basalt, andesite and diabase are found in the regions of the republic such as Tashkent, Turkestan, and Nurota.

The Nevich deposit, where the basalt occurs, is located 10-15 kilometers east-south of Parkent, near Tashkent. Black basalt stones lie in layers in the mountain ranges of the Nevichi River.

Dolomite layers with a thickness of 100 meters were found in the Kurama mountains, 50-70 kilometers from Tashkent. White dolomite stones are found in the south of Uzbekistan, in the Kashkadarya and Surkhandarya valleys in the south-west of the Guzor mountains.

Chiganoq limestone reserves are widespread in the south of Uzbekistan, in the Surkhandarya region. The thickness of limestone layers near Tashkent reaches 5-20 meters. These limestones are used to produce portland cement in Ohangaron. The thickness of limestone layers near the city of Bukhara reaches 150 meters.

There are more than 30 marble mines in Uzbekistan. "Ghozgon" marble from the Samarkand region is widely known to Soviet and foreign builders due to its reserve category, blockability and variety of colors. The walls of the World's Fair pavilions in

Paris and New York were covered with this marble. "Ghozgon" marble was used to cover the interior of many palaces in Moscow and partly to decorate the building of the Academic Opera and Ballet Theater named after Navoi in Tashkent . The beauty of marble stone, its use in construction and architecture has been known to the people of Uzbekistan since ancient times. In the city of Samarkand, Gori Amir, Shakhi Zinda, Ulugbek Observatory, Bibikhanim Madrasa, and historical architectural monuments, marble stones were widely used in the production of covering tiles, floor blocks, and benches.

There are many marble mines in the mountains of Surkhandarya, Bukhara, Samarkand and Tashkent regions of Uzbekistan. There are two marble mines near Tashkent, one of them is the Mingbulok mine. Mingbulok marble is large-grained, light gray. The latter is located on the western slopes of the Chotkal Mountains, between the villages of So'goq and Zarkent. This marble is white, yellow, pale grass and gray.

Healthy soil, a special type of soil, is a widely used material in the constructions of Uzbekistan. It resembles ordinary soil in terms of its chemical and mineralogical composition and origin. But healthy soil contains a lot of active clay ($AI_2 0_3$). There is a lot of healthy soil in our republic. Especially in regions like Tashkent, Fergana, Namangan, Andijan, Samarkand, Kokand, there are a lot of healthy soil reserves. The use of raw brick made from healthy soil in the construction of low-rise building walls indicates that it has high mechanical properties. Healthy soil is the main raw material in the production of bricks and ceramics. It is also widely used in plastering, cement production, and the preparation of multi-porous concrete and devices.

Basic information about wood

Wood has been an important building material since ancient times. Not very dense, highly durable, low heat transfer, ease of mechanical processing are the important properties of wood. In addition, wood has disadvantages: the properties of the series in different directions do not have the same value, it rots and burns easily, it is highly hygroscopic, it has various defects.

Constructive elements of buildings, various heat protection and finishing materials are made from wood. An important task of builders is to use wood economically and wisely. Recently, fibrolite, arbolite, wood-based and wood-based boards, as well as wood-plastic products, are made from wood waste - sawdust, shavings, sawdust and wood.

The tree is a perennial plant. It has a body, branches and roots. The trunk is the main and most valuable part of the tree, and the quality of its use as a building material depends on the structure of the trunk. The woody part of the body is in different directions and has a different structure. Usually, the tree trunk is viewed in three main cuts: transverse (torets), radial longitudinal (diameter or radius) and tangential longitudinal (watar) cuts (Fig. 1). The structure of wood cannot be studied with the naked eye, only through a magnifying glass and a microscope. The macro structure of wood can be seen with the naked eye, and its micro structure can be seen under a magnifying glass or microscope.

Macro structure of wood. When studying the macrostructure of the cross-section, the following main parts of the body can be easily distinguished: cambium, bark, wood and core (Fig. 29).

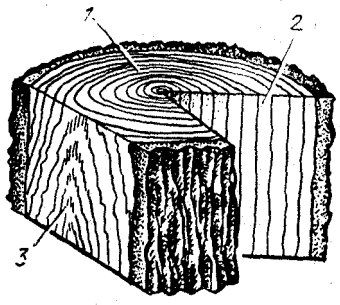
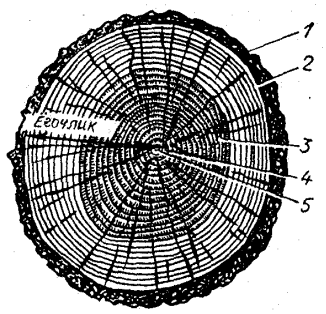


Fig. 29. Basic cuts of the tree trunk : 1-transverse (t o rets); 2-radical; 3-tangential



30. Torets cutting of the tree trunk: 1-bark; 2-cambium; 3-sub-bark layer; 4-kernel; 5-core

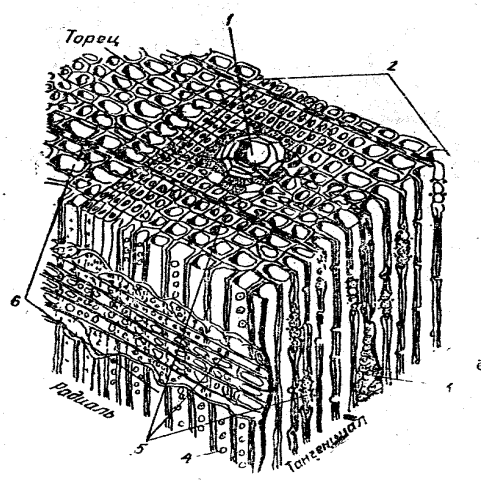
The bark protects the tree from the effects of the external environment. It consists of the outer bark, the middle part - the rind layer, and the inner part - the pulp. Lub transports the products of photosynthesis from the branches to the body.

Wood is a complex tissue of woody plants that conducts water and mineral salts dissolved in it, the main part of the trunk, roots and branches of woody plants.

Cambium is a tissue that forms new cells in roots and stems, and is located in the form of a single-row cylindrical layer in the form of a ring in cross-section, forming pulp on the outside and wood on the inside. Cambium is located between the wood and the bark, it is important in the growth process of the tree. A cross-section of the wood shows concentric layers of growth called *annual rings* . The rings are lighter towards the bark and darker in the centre. The light-colored part of the wood is called the bark layer (zabolon), and the dark-colored part is called the core. *Zabolon* is a living young cell, mineral substances move along the zabolon in a growing tree. The core consists of dead cells and does not participate in physiological processes, but ensures the stability of the tree trunk . Depending on the presence of kernels and sapwood, tree species are divided into cored (pine, oak, cedar, hemlock) and non-seeded (birch, linden, alder, alder) trees. Tree varieties with the same cross-section color and different moisture contents in the central and lateral parts are called mature wood varieties (beech, spruce).

The trunk is located in the center of the body and runs along the entire length of the tree. The core consists of initially formed loose tissue and rots easily.

In the cross-section of the trunk of oak, maple, beech and other tree species, thin radial lines, called core veins, are noticeable from the bark to the core; in the radial cut, they have the appearance of wide and narrow ribbons, and in the tangential cut, they have the appearance of short, slightly thickened lines. In a growing tree, root canals serve to transport nutrients.



31-rasm. Qarag‘ayning mikrostrukturasi. 1-traxendlar; 2-yillik qatlam; 3-vertikal smola yo’li; 4-o’zak chizig’i

In the wood of coniferous species, there are resin tracks located in longitudinal and transverse directions, in which resin accumulates. Tar tracks in the Torets shear form light-colored dots in the evening part of the annual layer, and dark stripes in the radial and tangential shears.

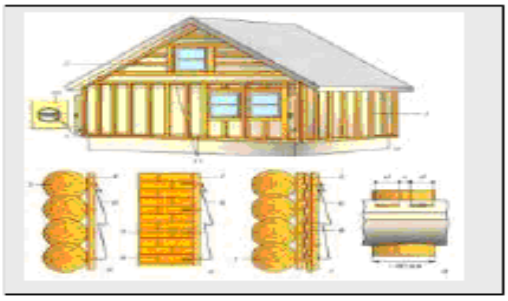
Microstructure of wood. When studying the structure of wood under a microscope, you can easily identify a very large number of living and dead cells of different sizes and shapes. A living cell has a shell, proplasm and nucleus. According to the tasks, the cells are divided into conducting, mechanical and sad cells.

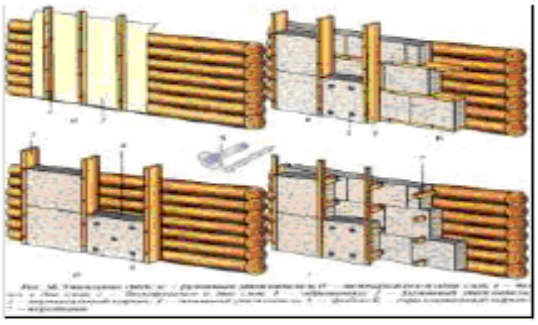
Conductor cells serve to transfer nutrients from roots to branches and leaves. The conducting cells of leafy varieties are called vessels, and in needle-leaved varieties they are called tracheids (water-conducting tube of the plant). Veins are thin-walled broad-banded tubes running through the body, vertically one above the other and interconnected. Tracheids are closed cells with beveled or pointed ends. Tracheids vary in size at the boundaries of the annual layer . For example, evening wood has thin cells with thick walls, while morning wood has wide cells with thin walls.

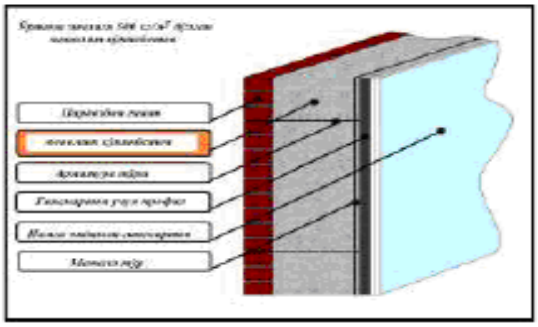
Wood fibers from deciduous tree species, and late wood tracheids from coniferous tree species serve as *mechanical (supportive) tissues.* Wood fibers consist of elongated cells with thin walls at the ends. They are evenly distributed throughout the annual layer and due to their close connection, deciduous tree varieties are as strong as they need to be.

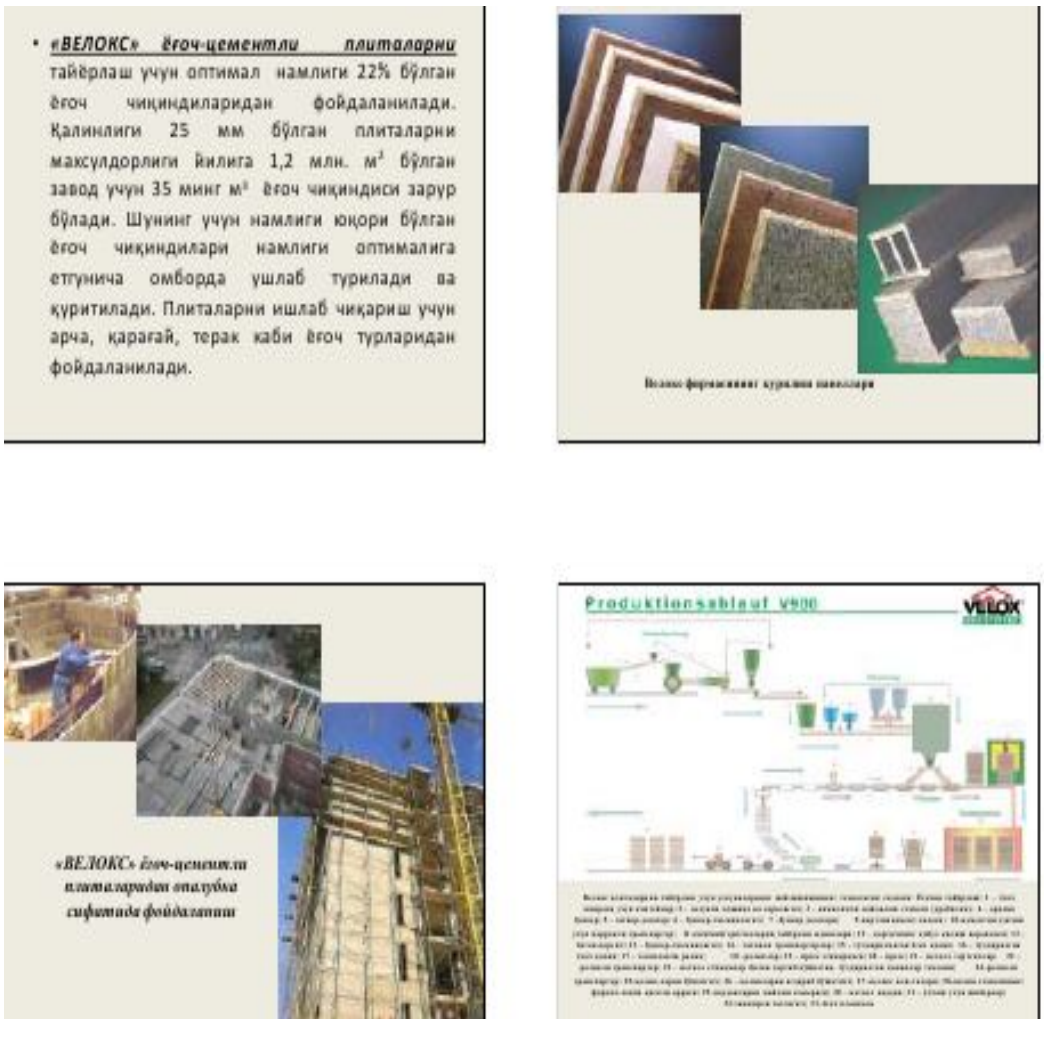
Worm cells serve to create a reserve of nutrients and transfer them in a horizontal direction. These cells are thin-walled and have large cavities. Most of them are located in the trunk fibers.

The microscopic structure of wood is studied by specially prepared thin sections (transverse, radial and tangential). The structure of pine is shown in Figure 3.









Physical and mechanical properties of wood .

Wood, as an anisotropic material, has very different physical and mechanical properties, which should be taken into account when using tree varieties for various devices of buildings and structures.

The main physical properties of wood are its color and texture, real and average density, moisture, hygroscopicity, drying and rotting, heat transfer and resistance to negative environments.

it is 1.55 gG'cm ^{3} ·

The average density of wood depends on the type of wood, porosity, growth conditions, humidity and other factors. In most species, its size is less than a certain unit and usually varies in the range of 0.37 - 0.7 gG'cm ^{3} ·

wood . There are three types of moisture in wood: capillary (free) moisture in the pores of cells and between cells, hygroscopic moisture in the walls of cells, and chemical moisture included in the chemical composition of wood substances.

According to the level of moisture, wood is distinguished as follows: wet (wood soaked in water), recently cut (wood with a moisture content of 35% and more), air-dried (with a moisture content of 15-20%), room-dried (moisture content 8-12%) and absolutely dry wood dried to a constant mass in the experiment at 100-105 ^{0} C, etc. Wood with a moisture content of 12% is considered standard wood;

consistency and density indicators should be equal to the standard moisture indicator. In construction, it is allowed to use wood boards with a moisture content of 15-20%, but devices and details made of highly wet wood-board will warp, dry out and crack in many places when it dries, and the wood-board is different damaged by fungi.

Wood *hygroscopicity* indicates the ability of dry wood to absorb moisture from its environment or release moisture to dry air. Wood moisture always changes as a result of environmental humidity changes. In the absence of free moisture, the maximum amount of hygroscopic moisture in a wooden board is called the fiber *saturation point* or *hygroscopic limit. For different types of trees, its value varies around 25-35%.* The moisture content of a wooden board stored for a long time under constant conditions of relative humidity and temperature is called *equilibrium moisture content* . A change in wood-board moisture content from zero to the saturation point of the fibers, and then from the saturation point to zero, causes a change in the volume of the wood board, which in turn causes the wood to warp. and leads to build.

The thermal conductivity of dry wood is very small - 0.171 - 0.28 WtG'(m $\cdot^0$ C), but as its humidity increases, the thermal conductivity also increases.

Mechanical properties. Due to the fibrous structure of wood, its resistance to mechanical effects is also different in different directions. In addition, the mechanical properties of wood depend on the type of wood, its humidity and defects. It is necessary to take into account these features when using wooden floor materials in construction . The average value of the physical-mechanical properties of wooden boards obtained from the main tree species is presented in Table 13.

Table 13. The average value of the physical and mechanical properties of the main coniferous and deciduous tree varieties (moisture 12%)

Tree species	Average density kgG'm ^{3}	the walls , MPa				
		in stretching	in compression	in static bending	on the radial	in the crack
Pine	500	110	48	85		7.5
Tilogach	660	125	62	105		11
Black spruce	450	120	44	80		6.8
Okgaragai	370	70	40	70		6.5
Dub	700	130	58	106		10
Buck	670	130	56	105		12
Birch	630	125	55	110		9.2
Togterak	480	120	42	78		6.2

It is highly resistant to compressive strength along the grain of wood. This property of it is taken into account in the use of sepoys, columns and the like. It is more resistant in bending and stretching along the wood fibers. This property is related to the structure of the tree: the particles of the fibers are connected longitudinally, and some fibers are more weakly connected. The mechanical

properties of wooden boards are determined by experimentally testing specially prepared samples.

The mechanical properties of wooden boards depend on their moisture content . As the moisture content increases to the saturation point of the fibers , the strength of the wood decreases, which is especially noticeable in static bending and compression. The presence of defects in the wood board (splits , twists, etc.) greatly reduces its mechanical properties .

Or defects of wood

Deviation of the wood structure from the normal structure, curvature of the tree trunk, as well as various damages affecting its technical properties are called wood defects. Defects reduce the quality of wood and limit the field of use in construction. Defects can be divided into the following main groups depending on the causes of their appearance: branches, cracks, distortion of the shape and structure of the tree trunk, color and damage by insects.

Branches penetrate into the trunk of the tree. This is the most common defect. Branches break the uniformity of the tree structure, make processing difficult and deteriorate its mechanical properties.

Depending on the degree of fusion with wood, there can be growth branches (full or partial) and winding branches. Tumor (Fig. 4,a) and partially tumor hard branches are usually healthy, do not show signs of decay and are dark in color. The hornbeam (Fig. 32, b) has absorbed a lot of healthy and resinous substances from the wood. Wrapping branches (Fig. 32,v) create holes or decayed surfaces in wood materials. They are referred to as branching hard branches and soft branches.

For the manufacture of wooden devices, only trees with growing healthy branches are used, the number and sizes of branches depend on the type of wood.

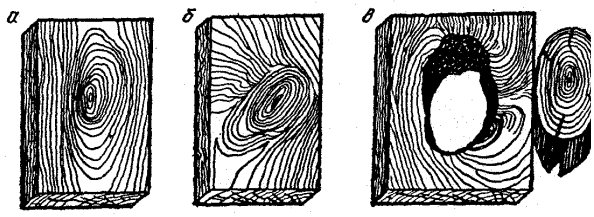


Figure 32. The type of bushes and shrubs according to the degree of overgrowth with surrounding wood . a-gone s o g l o m; b-expanded sh o x; v-decreasing.

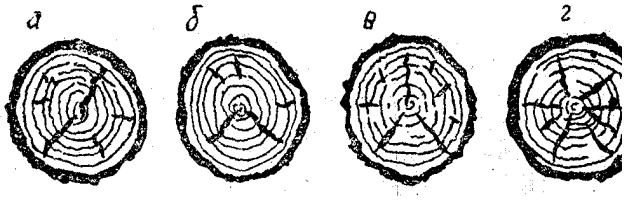


Fig . 33. Types of seams.
a-krestsim o n metic;
b-yosim o n portable; crack from vs o vuk;
g-dry cracks.

Cracks can appear both in a growing tree and in a felled tree as a result of uneven compression when the wood dries, sudden changes in temperature during the winter and other reasons. This common defect of wood destroys its uniformity, reduces its strength and causes rotting. The following types of cracks are distinguished depending on the time of their appearance and the nature of damage in timber and timber materials: cracks, splits, cracks from frost, cracks during construction (Fig. 33).

Chatnok consists of one or more internal longitudinal cracks that pass through the core of the tree trunk and taper from the core to the edge. Chatnok is divided into simple and idol-shaped chatnok (Fig. 6 , a). A typical chatnok consists of one or two cracks located along one diameter in cross-section. *Idol-* shaped chatnok is formed by one or more cracks, one of which is at an angle to the other in cross-section. Chatnak *is suitable* (if the seam runs in one plane along the body) and *non-smooth* (if the seam is helical). Chatnok affects the quality of the material when sawing logs. Poor chatnok reduces the output of quality material.

joists have the appearance of a circular joint (full joist) or an arcuate appearance (short joist). .

Cold cracking (Fig. 33, v) is an external longitudinal crack of the tree trunk, which is wider on the outside and narrows towards the core. It occurs as a result of sudden temperature changes during winter. This defect greatly reduces the quality of the beams.

Construction cracks (Fig. 33, g) usually appear in the rooms when the wood dries and in the materials when it is cut . They often have a radial direction and cause a sharp decrease in the quality of the oil .

Deviation of the trunk of the tree from its normal shape is a very common defect *,* which is usually caused by the growth of the tree in unfavorable conditions and the influence of the climate . The main defects of the body include curvature , excessive thinning of the upper part of the body (clumping), excessive thickening of the bottom part (clumping). They greatly reduce the quality of the wood and are considered the causes of defects in the tree structure . It is necessary to show twists, twists, displacements of annual rings and others in light structural defects of wood .

The curvature of the *body* is one- sided and different depending on the direction of bending . When sawing logs , it dramatically reduces the output of sawn construction materials . *Aggregation significantly* increases the consumption of raw materials in the sawing of logs and containers . *Abdominal atrophy* is defined as a sudden thickening of the abdomen in relation to the rest of the body . Twisted wood is wet in the oblique (screw) direction of the fibers . This defect greatly worsens the mechanical properties of the wood , and also contributes to the construction and warping of the wood . Warp is a wavy or confused arrangement of wood fibers , which reduces the bending strength of the wood and makes it difficult to work with it .

Fungal damage to wood stoves Fungi damage both wood and wood stoves . They are produced from spores that are easily carried by wind , insects , birds , etc. Fungi thrive in certain conditions : when the humidity of the wood is high (20-60 %), when there is no candle burning and when the temperature is 0-60 ^{0} C. can be changed . Fungi do not develop in negative conditions , but they do not die either . Fungi are always killed above 60 ^{0} C. _ Fungi cannot grow in wood that is in water , because in such a case there is no oxygen necessary for their survival .

The most dangerous are real house, white house , house curtains , cotton and other fungi that quickly develop in wooden devices of buildings , sleepers , pillars and other places . In a short period of time, they eat both conifers and broad - leaved trees.

Wood damaged by fungi not only quickly loses its mechanical properties , but is also dangerous for healthy wood, as spores can spread over long distances . it will arrive easily . _ It is necessary to take measures to protect such wood from damaging other wooden devices in the vicinity .

insects (bark- eating beetles, hairy beetles , furniture or house-oil) of growing and cut trees, as well as wood burning devices can be damaged by o ch beetles). Damage - the place where the worm fell , the path and holes opened by insects will be wet side. According to the depth of the place where the worm landed , there are superficial (shallow) and perforated places , and according to the size of the holes, small (the diameter of the hole is less than 3 mm) and large (the diameter of the hole is larger than 3 mm). can be

Determining and protecting the durability of wooden constructions _

Increasing the durability of wood- burning devices and products is achieved by using effective methods of preserving wood from decay . Such methods include drying wood , antisepticizing it (decontamination with chemical substances) , providing the surface with resistant compositions that protect against fire , and constructive measures to prevent equipment from getting wet during use . - learning how to take action, as well as use glued wooden devices .

Drying of sawn building materials is considered one of the main activities . If this is done, the service life of wood- burning devices and products will be much longer and their quality will increase . Oil can be dried naturally and artificially.

Natural drying is carried out in the open air , under blankets or in dry air in closed rooms . It takes a lot of time (weeks or even o.) for such drying months), this method is used when the oil is stored carefully and for a long time, or when the volume of work is not very large .

Wood is artificially dried in wood - board drying chambers using heated air , gas , steam or high - frequency current , as well as by soaking in heated petroleum . Artificial drying of wood in chamber dryers is the most common method . It is equipped with the equipment that allows to send . It is continuous and intermittent devices. Compared to natural drying, artificial drying has several advantages. In this case , the drying time is much shorter, the moisture content of the wood is low (6-8%), and the quality of the dried wood is also high . Fungal infections and insect pests are eliminated, as well as efficient use of wood pallet stacking space , as chamber drying space is limited.

6 - Lecture	Modern materials for p ardevors

(lecture - 2 hours)

1.1. Lecture technology

Study time: 2 hours	Number of students: 50
Training form	Informative lecture
Lecture plan	1. The main classifications of workers. 2. Anelli, lita and blocks, frames, modules, glass blocks. 3. Ardevors in humid rooms.
1. The purpose of the training session is to introduce information about modern materials for workers .	
educational tasks:	*Learning outcomes:*
Here are the main classifications of workers gives information.	they will learn about the main classifications of workers .
It introduces the work of anelli, lita and blocks, framed, modular, glass blocks .	They will learn about the work of anelli, lita and blocks, frame, modular, glass blocks.
the work in humid rooms .	learn about the workers in humid rooms .
Teaching tools	Lecture text, blackboard, computer, projector, slides.
Teaching methods	Informative lecture, blitz poll, brainstorming,
Teaching forms	Work in a team.
Teaching environment	An audience that can be estimated by technical means, and the method of working in groups can be applied.
Monitoring and evaluation	Oral questions.

Technological map of the topic of providing an understanding of prestressing methods .

Work steps	The content of the teacher's activity	The content of the listener's activity
Stage 1 Introduction to the topic (10 min)	1.1. Explains the topic, plan and results of educational activities. 1.2. Asks questions to enliven the topic. (Appendix 1).	They listen. They answer questions. They listen.
Stage 2. Main section (70 min)	2.1. Gives a lecture (Appendix 2). 2.2. Asks questions to strengthen the lecture. (Appendix 3)	They listen and write. They listen and answer.

Stage 3. Finisher (10 min)	3.1. Makes final conclusions on training. 3.2. He asks questions to prepare for the next topic. (Appendix 4).	They ask questions. They listen and write. They write.

Modern materials for p ardevors

COVER MATERIALS _

Currently, the construction of buildings and structures is rapidly moving from the "hopl" method to the "dry" method. Modern building construction is unimaginable without covering materials, wood chipboard, cement chipboard, plasterboard sheets or similar materials. Despite the fact that traditional wooden boards are environmentally friendly, durable and strong, their dimensions are small. Due to the lack of wood in Central Asia, its use is limited for some reasons.

With the appearance of roofing sheets in the market of building materials in Uzbekistan, it quickly became popular.

According to data, 90% of coating materials are used in finishing works in the USA and Western Europe. The development of this trend is also felt in Uzbekistan, but due to the small number of types of water-resistant coating materials in the local building materials market, the pace of their production and use remains low.

High-quality production of traditional building materials on a scientific basis, adaptation of their creation technologies to modern requirements, development of cheap, economical, high-quality materials and technologies, acquisition of new and high-quality materials, creation of their cost-effective technologies, improvement of methods of renovation and reconstruction of buildings and structures, and in this process, tasks such as efficient use of materials are among the most important issues.

"VELOKS" wood-cement boards (Fig. 61). The production of 25 mm thick pressed plates is 1.2 million per year. 35,000 m ^{3} of wood waste is required for a factory of ^{2} m2 . Therefore, wood waste with high moisture content is kept in the warehouse and dried until it reaches the optimal moisture content. wood types such as spruce, larch, poplar are used for the production of plates.

$_2$ (approximately) 5-6 kg, and 100-150 liters of water are used for the production of 1 m ^{3} slab.

Wood logs with a moisture content of 22% are loaded into the receiving hopper of the shredder using a loader. With the help of a belt conveyor, wood chips are transferred to the "SHspringer" shredder, where they are crushed into fractions up to 3x5 cm. Productivity of the grinding machine is 15-20 m $^{3 \text{ per hour}}$. From there, by means of a pneumatic conveyor, it is sent for secondary grinding in a hammer mill to a size of 0.5x5 cm.

The chopped wood is divided into fractions in the sorting drum (2), the suitable ones are sent to the hopper (4) (Fig. 62), the large fractions are sent to the hammer mill for re-shredding through the belt conveyor, and the small waste is sent to a special hopper for use in the preparation of other types of boards.

The amount of chopped wood that meets the requirement is crushed in the grinder dispenser (5) and sent to the dispenser of the mixing equipment.

Mineralization of wood particles is carried out in a continuously operating furnace (12). For this purpose, nozzles are installed for sprinkling mineralizer - calgeptic chlorine at the place where wood falls into the reservoir. The mineralizer is sent from special containers (11) to the nozzles using a pump.

The preparation of mineralizing solutions is carried out in two containers, and the finished solution is stored in one of them (11). Calcium chloride is placed in a bag in one of the containers fitted with a stirrer. Water is automatically pumped there to prepare a solution of the required concentration.

and water are added to the top of the concrete slab (12) with the help of measuring devices (10), and all the mass in the concrete slab is thoroughly mixed.

The whole process of preparing wood-cement mass is automated. If there are some errors in mineralizer concentration or measurement, the process is automatically stopped.

The finished wood-cement mass is placed in the wooden molds (15) moving through the slats (31) in the following order:

- the lower layer (16) is put in a bag and wooden planks (as slats) are installed;
- Details (33);
- Put the top layer;
- All the mass is pressed with the help of rollers (18) and the sides of the molds are cleaned;
- Molds are placed on a special shelf.

Collected molds are placed on a vertical rack. depending on the thickness of the plates, the number of molds is different: when the thickness of the plates is 25 mm, the number of molds is 40, when the thickness is 35 mm, 31, and when the thickness is 50 mm, 25. compaction of the package is carried out under a pressure of 5-6 kg/cm ^{2} using a hydraulic press (20) located above the hydraulic cylinders. The compacted package is automatically pulled and closed with the help of metal racks (21) and sent to the warehouse to be held for 1 day using the roller conveyor (22). Heat is well stored in wooden molds, and during the chemical reaction, the temperature °rises to 50-60 C. After 1 day, the batch of molds (23) is sent to the machine (24) that automatically removes the layers.

With the help of special mechanisms, the cover is removed and sent to the plate molding conveyor (30), the plate and the mold to the machine (26), which removes the finished plate from the wooden mold.

In the machine, the sheet is removed from the form and sent to the forming machine (28) for cutting the edges using a chain conveyor (13). After the mold (15) is cleaned and lubricated, it is sent to the main conveyor for further molding.

The technological line produces 5-6 plates per minute with a size of 2000x500x25 mm.

Plasterboard sheets. Gypsum plasterboard is a decorative coating material, and easy installation is not difficult. It is used only in the interior of the building . Used in non-moisture conditions. It is a difficult optimizing material. Resists for a limited time.

Gypsum board is compacted by placing plasterboard between double-sided paperboard, and then dried. When making plasterboard, the sheet is heat treated at a temperature of °145-155 C, the initial temperature °is 120-135 C. During the heat treatment period, when heat treatment is given for 45-80 minutes, the initial humidity of plasterboard sheets decreases from 34-42% to 2%. This is one of the main indicators of the bending strength of the material. To increase the bending strength, small joints can be added. Additives that increase plasticity are added to the mixture. Both sides of plasterboard sheet are covered with cardboard. Length 2000-4000 mm, width 600-1200 mm, thickness 6.5; 8.0; 12.5 and 24.0 mm sheets are produced.

Plasterboard sheets are used in environments with less than 60% humidity, under normal conditions they are covered everywhere . When affected by moisture, their strength decreases and they break easily.

It can be cut, it is easy to polish, and the edge is smoothed by the equipment. Production of plasterboard sheets is carried out as follows.

Using the carton opening and transfer machine, the cardboard sheet is transferred to the belt conveyor. at the end of the movement of the canvas, a plaster guard is installed on the molding table between the lower and upper canvases. Ready gypsum mixture is poured on top of the bottom cardboard. the edges of the bottom cardboard are bent using a special bending device and folded up to form a board. The width and thickness of the board is created when the cardboard is rolled. Then the upper cardboard is closed, and with the help of a compacting drum, it is possible to create the required size according to the thickness of the sheet. Shapers are installed along the conveyor line along the thickness and edges of the sheet. Next, the canvas is fed to the conveyor with a

roller, and the plasterboard is installed on it, and it cuts the plasterboard sheets to the required thickness.

The cut sheet is fed to the side line by means of a roller conveyor and brought to the drying chamber by means of a transporter elevator. The drying chamber consists of six tiers and is equipped with a device that absorbs the moisture released from the sheets during drying from inside the chamber.

During drying, the temperature in the chamber is chosen in such a way that the moisture content of the sheets coming out of the chamber should not exceed 5-7%. The temperature in the chamber is controlled by a computer in the control panel.

Approximate indicators of the temperature in the drying chamber are as follows:

- 180 at the entrance from the oven to the chamber – 200 °C;
- at the exit from the camera - 90 - 100 °C.

Then, the dry sheets are transferred to the fast-cutting machine for cutting the edges of the sheets by means of the discharge conveyor, and from there to the finishing table of the finished product. The finished product is placed on pallets and sent to the finished product warehouse.

Glass packages

Bottle packs are hermetically sealed constructions in which two or more sheets of glass are joined together by means of an intermediate frame and a hermetic seal. The space between glass sheets can be filled with dry air or inert gas.

The aluminum intermediate frame is filled with a special adsorbent that absorbs excess moisture and resists the formation of condensate between glass packages.

One of the advantages of the bottle is that it is hermetically sealed, which prevents moisture and dust from entering the bottle. The hermeticity of the glass package is made due to the primary and secondary sealing layer. Primary sealing involves applying sealant to the edges of the intermediate frame, and secondary sealing involves applying sealant to the entire edges of the glass package.

Glass package is one of the main elements of modern window construction.

As the glass package forms the main surface of the window, the heat-technical and sound insulation properties of the window structure depend on the properties of the glass package, not on the number of chambers of PVC or aluminum profiles.

Glass blocks

Glass blocks are a hermetically sealed product made by connecting two pressed glass plates (half blocks).

They are used in the construction of bathroom walls, curtains between rooms, decorative elements on the walls, etc.

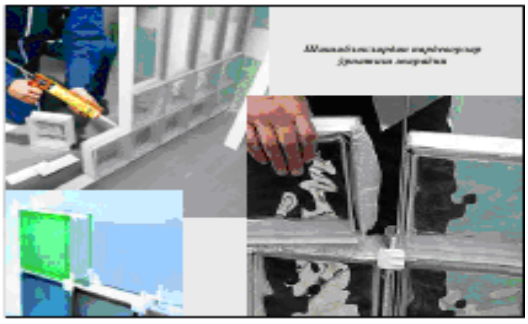
Each half-layer of glass blocks is made with a thickness of 6-7 mm. The surface of glass blocks can be flat, concave or convex, transparent, opaque and colored. Based on these, they are divided into clear (flat surfaces), light-scattering and light-reducing (glass blocks with concave or convex lines).

You can find pressed glass blocks with a thickness of 7.5 to 10 cm. The weight of one glass block can be from 2.5 to 4.3 kg. Usually, their shape can be rectangular or square. The size of modern glass blocks is 19×19×8 cm or 24×24×8 cm (Fig. 20). In addition, glass blocks can be produced in triangular, angular and round shapes if necessary.

Glass profiles

Glass profiles are transparent or colored profiled bottles made by continuous rolling. Their surface can be smooth, concave or convex, absolutely transparent or opaque. Also, in order to give high strength to the structure, glass profiles reinforced with a metal top can be produced. They are produced in the form of boards with a thickness of 6-7 mm, a width of 250 or 500 mm, and a length of no more than 7000 mm (Figures 23, 24).

This material is used in the internal constructions of buildings that lighten and catch light, and in the finishing of facades.



7 - Lecture	Modern thermal insulation materials

(lecture-2 hours)

1.1. Lecture technology

Study time: 2 hours	Number of students: 50
Training form	Informative lecture
Lecture plan	1. General information.

	2. Fiber-framed mineral, gas-prepared, glazed mineral and organic thermal insulation materials. 3. Additional insulation of various structures
4. The purpose of the training session: Students Modern thermal insulation materials introducing information about.	
educational tasks:	*Learning outcomes:*
Provides general information about modern thermal insulation materials .	In the lecture , they will have an understanding of general information about modern thermal insulation materials
Introduces mineral thermal insulation materials with a fiber frame .	They get acquainted with mineral thermal insulation materials with a fiber frame
Gives information about thermal insulation materials made by forming gas .	They can explain about thermal insulation materials made by forming gas .
Gives information about mineral thermal insulation materials .	They will learn about mineral thermal insulation materials
Provides information on organic thermal insulation materials .	They will learn about organic thermal insulation materials
Provides information on additional insulation of various structures .	Learn about additional insulation of various structures
Teaching tools	Lecture text, blackboard, computer, projector, slides.
Teaching methods	Informative lecture, blitz poll, brainstorming,
Teaching forms	Work in a team.
Teaching environment	An audience that can be estimated by technical means, and the method of working in groups can be applied.
Monitoring and evaluation	Oral questions.

Modern thermal insulation materials **technological map of the topic of giving an understanding of**

Work steps	The content of the teacher's activity	The content of the listener's activity
Stage 1 Introduction to the topic (10 min)	1.1. Explains the topic, plan and results of educational activities. 1.2. Asks questions to enliven the topic. (Appendix 1).	They listen. They answer questions. They listen.
Stage 2. Main section (70 min)	2.1. Gives a lecture (Appendix 3). 2.2. Asks questions to strengthen the lecture. (Appendix 4)	They listen and write. They listen and answer.
Stage 3 Main section (70 min)	3.1. Gives a lecture (Appendix 3). 3.2. Asks questions to strengthen the lecture. (Appendix 4	They listen and write. They listen and answer.
Stage 3. Finisher (10 min)	3.1. Makes final conclusions on training. 3.2. He asks questions to prepare for the next topic. (Appendix 5).	They ask questions. They listen and write. They write.

Modern thermal insulation materials
HEAT INSULATION AND ACOUSTIC MATERIALS

Heat-insulating materials refer to the materials used in the construction of residential and industrial buildings, heat units, and pipelines to reduce heat transfer to the environment (Fig. 46).

Heat insulating materials are classified according to the type, shape and appearance of the main raw materials, structure, density, hardness and thermal conductivity.

Depending on the type of the main raw materials, heat-insulating materials are made on the basis of different types of mineral raw materials (rocks, slag, glass, asbestos), inorganic, organic (natural organic materials for their production - peat, wood fiber materials are used as raw materials serves) and is bound to materials made of plastic masses.

Heat-insulating materials of slag and thickness are attached to hard (plates, shell, cement, gypsum, cylinders and flexible fabric, cord-woven bags) and soft and scattered (cotton, perlite sand, vermiculite) materials.

According to the structure, heat-insulating materials are divided into fibrous (mineral cotton, glass fiber, granular perlite, vermiculite) gpovac (products made of gpovac concrete, foam glass).

According to the density , heat insulating materials are divided into: 15, 25, 35, 50, 75, 100, 125, 150, 175, 200, 225, 250, 300, 350, 400, 450, 500, 600, 700 brands.

Soft (m) materials (mineral cotton, glass cotton) are half bikr - staples made on the basis of a synthetic binder, plates made of glass fiber, etc., bikr (j) plates made of mineral cotton on the basis of a synthetic binder, high bikr (J), hard (T) materials.

In terms of thermal conductivity, thermal insulation materials are divided into the following classes:

A - low thermal conductivity - 0.06 W/m·K; average thermal conductivity - 0.06 - 0.115 W/m·K;

V - thermal conductivity is high - up to 0.115 - 0.175 W/m·K.

Thermal insulation materials are used for heat insulation (protective) - construction (for insulation of building structures) and heat insulation assembly (for heat insulation of industrial equipment and pipelines).

In general, heat insulation materials are divided into 2 types: inorganic and organic heat insulation materials.

Expanded vermiculite

Boiled vermiculite - natural rock vermiculite °is obtained by baking at a temperature of 1000-1100 C with a boiler. The average density of compressed vermiculite depends on the size of the granular particles and ranges from 80 to 400 kg/m ^{3} · Thermal conductivity is from 0.05 to 0.9 W/m ^{0} K (Fig. 47).

Cobbed vermiculite is obtained by burning natural vermiculite °at a temperature of 900-1200 C. Due to the fact that the volume of such aggregates increases by 10-20 times during thermal treatment, the density of the stack is very small.

Light aggregates should meet the technical requirements for these materials in terms of size, bulk density, density and other parameters. In terms of size, light aggregates are divided into large and small types, just like dense aggregates. The sizes of large aggregates are 5-40 mm, and they include light gravel or crushed stone. Gpovak shagpal or pebble stone is packed into the following size grains: 5-10; 10-20; 20-40 mm. Fine aggregates are less than 5 mm in size and

include light sands. Light sands are packed in two different grain sizes. The grain sizes of fine sands are less than 1.2 mm, and those of coarse sands are in the range of 1.2-5 mm.

According to the pile density, gpovac accumulators are divided into the following brands: 100, 150, 200, 250, 300, 350, 400, 500, 600, 700, 800, 900, 1000, 1100, 1200.

The quality of the Gpovac aggregates mixture depends on the granularity of the coarse and fine aggregates. The relative amount of large and small aggregates can be reduced. This leads to saving the amount of cement used in lightweight concrete and improving the technical properties of concrete.

The amount of water-soluble sulfuric acid salts (calculated relative to SO_3) contained in gpovac aggregates used in lightweight reinforced concrete installations should not exceed 1% by mass of the aggregate.

One of the main properties of the Gpovac large aggregate is the compaction strength, which is determined by crushing the grains in a poplat cylinder.

IZOROK

The selection of raw materials for the production of Izorok mineral cotton is made based on the requirements for the manufactured product. The main raw material for the production of Izorok mineral cotton is gabbro-basalt rock (Fig. 48). In production, the chemical, mineralogical and fractional composition of raw materials components, precise control of its moisture content is one of the factors in production (Figures 48-54).

Dissolving the components in a steam bath It is carried out at a temperature of 1500 °C , the opnlab parameters are controlled using a computer, and a solution with the required chemical composition and viscosity is prepared.

Melting is carried out in a steam bath or coking furnace. A bath steamer consists of a tank heated by burners, into which the components are poured using dispensers. The coking furnace is a new generation smelting unit with increased productivity.

The solution falls into the centrifuge, the fibers are formed by centrifugal forces, and the fibers are blown into the fiber collection chamber by air flow. In the camera, the fiber is treated with binders, modifiers and dust-free additives.

Fiber shafts are produced using a cup shaft centrifuge rotating 7000 times per minute. The resulting fiber is spun in a drum-type chamber and treated with water-repellent and dust-free additives.

To create a mineral fiber carpet, the proper distribution of the fiber is done by using a pendulum distributor in several layers, and the density of the fibers is varied. Then, the copra made of mineral fibers is compacted.

The produced copper is put into a heat treatment chamber. There, the binder polymerizes and acquires the necessary properties - thickness, density and strength.

The production unit is equipped with a vertical milling machine with a modern cutting unit and horizontal band saws, which allow to create mineral plates and slabs of exact size in terms of length, width and thickness.

Packaging of the product in heat-resistant film is carried out on a line consisting of three machines, which are automatically controlled depending on the production efficiency and the type of product. The manipulators of the conveyor automatically sort the mineral plates and tiles according to their size.

The finished product, which is stored in a closed warehouse with dry conditions, can be delivered to the customer's request by car or rail transport.

"Isover" insulating materials

Due to the variety of glass products, today it is still the main field of activity of the Saint-Gobain company. This company pays great attention to the production of insulating materials based on glass-cotton and mineral cotton. Architects in Europe and beyond consider these insulating materials to be among the best from a technological point of view. It refers to the solution of various issues related to insulation, the importance of which is constantly increasing (heat insulation, sound insulation, fire protection, environmental protection). Saint-Gobain Isover

insulating materials are an example of high-quality products. "Isover" insulating materials, if all the necessary conditions are met (heat-insulating windows, heat-insulating drum entrance doors), as well as properly functioning (heating system), can be estimated to significantly reduce energy consumption. "Isover" thermal insulation materials with a thickness of at least 8 cm for external walls, 6 cm for floor coverings, and 14 cm for roofs provide an opportunity to cover new and alternative methods of heating in the future. Heat pumps, solar collectors, wind turbines or heat adsorbers cannot be used economically without perfect thermal insulation of buildings.

The comparative data on the heat insulation coefficient per 1 m ^{2} of the surface of the building shows how much energy independence can be achieved. These data can be recalculated in terms of liters of fuel using the benchmarks published by the German Ministry of Economy. Thanks to the use of "Isover" thermal insulation materials, heat transfer coefficients can be significantly improved. For example, the use of "Isover" insulation with a thickness of 8 cm for the outer wall, 6 cm for the basement floor, and 12 cm for the upper floors will result in a heat transfer coefficient of 0.36, respectively; It improves to 0.51 and 0.31 (Table 7).

Table 7

Heat transfer coefficients using "Isover" insulation

Building element, 1 m² surface area	Simple performance without insulation
Outer wall	K=1.33/15 l
Ertopla ustyopmas	K=2.25/13 l
Inter-floor transitions	K=3.73/33 l

"Schwenk" light construction plates

one of the most reliable insulation boards offered by manufacturers of insulating materials . Thanks to improvements, for example, the development of lightweight building boards with mineral wool gaskets, this type of insulating material will not cover the opz value in the future.

"Schwenk" cement-bonded lightweight building boards consist of long fibers obtained from long-term, undecayed wood. In this case, a high-quality cement mixture is impregnated into the homogeneous wood fiber and pressed into solid plates.

"Schwenk" with mineral cotton gasket is light insulation boards

"Schwenk" lightweight insulation board with mineral wool gasket consists of two upper layers of mineral wool and wood fiber with a thickness of 7.5 mm, which are connected by means of a cement binder. "Schwenk" lightweight construction boards with mineral wool copp layers are suitable for construction of all types of industrial, commercial and public buildings, especially pavilions.

These plates also have good acoustic properties. gpovac structure of the plate surface and mineral cotton gaskets ensure absolute sound absorption.

"Schwenk" boards with mineral wool gaskets are a new step in the production of lightweight construction boards with copper layers.

"Schwenk" insulation bricks made of wood chips

"Schwenk" insulating bricks made of wood chips combine double thermal insulation, optimal heat accumulation, high air absorption and excellent sound insulation. Due to the listed properties, these plasters are an excellent wall material. The fact that wood has been used for thousands of years as a tried and tested natural insulating material has prompted the creation of insulating gypsum from wood chips. Wood chips are mineralized and turned into a stone-like material with the help of cement. In this case, the gpovac structure is not destroyed, which is very important from the point of view of predicting good insulating properties. The insulating material obtained in this way is pressed in molds. Walls made of "Schwenk" insulating plaster with wood chip have the advantages of wood and concrete, but do not retain their disadvantages.

"Schwenk" insulating plasters made of wood chips are distinguished by their simplicity of use. They are picked dry and filled with concrete. In this case, the heat exchangers do not close, because the joints filled with the compound do not close.

An energy efficient home ensures a reliable future

Energy prices have long been a problem in Germany. Fossil fuel prices are falling all the time and the outlook is not optimistic. Homeowners cannot resist such price pressure. Since 2002, the Energy Savings Directive limits the fuel consumption figure for newly built and renovated houses to only 9.5 l/m² per year. Although this has improved the situation a little, the burden on the family budget is still very high. An alternative solution to this problem is an energy-efficient house. An example is the energy balance of such a house in Unterfranchen, which was compiled a year after the families were moved to a new house. The need for heat energy and hot water for the heating of this house is primary energy per 1 sq.m. This amount corresponds to the consumption of 5.3 l of fuel oil to obtain hot water and heat the 263.5 m² heated surface of the house. Thus, the energy consumption rate is 44% lower than the rate recommended in the energy saving guide. Many homeowners dream about it. In the first year of use of the house, the cost of heating and hot water was 750 euros, and the cost was 2.85 euros/m² per year. With such a low energy consumption, this house meets the requirements for an energy-efficient house with an annual energy consumption of 60 kWh/m².

How was such a great result achieved? From the beginning, it was not only a question of modern hospitality decoration, but also a question of minimal energy consumption for heating and hot water. With this in mind, the house was designed to be energy efficient. The very low energy consumption of this house is mainly explained by its construction. The rational construction of the walls is of decisive importance, and thermal insulation begins with it. The used construction material, porous foam concrete, creates conditions for good thermal insulation. It provides a comfortable microclimate in the rooms and significantly reduces energy consumption. For the construction of external walls, 30-cm-thick porous flat blocks made of 8-cm-thick mineral-copper material with insulation were used. The advantages of such blocks compared to other building materials are, first of all, their high thermal insulation ability, which is estimated by their gpovac structure, as well as their high level of durability. In addition, picking light, large-sized blocks on top of a thin layer of mix has been very effective.

Other factors that contributed to this home's low energy consumption include wood windows with insulating glass, a thermally insulated roof, basement insulation with mineral fiber fabrics for impact noise insulation, and an insulated gap between the garage and utility room. A large share of energy savings was achieved due to the heating of the building with the help of a gas boiler and furnace working with wood and pellet fuel. The fireplace heats 70 m² on the first floor and creates a comfortable microclimate. The solar thermobattery heats the water needed for the household using solar energy.

Heat insulating plaster

Each plaster has a certain degree of resistance to heat absorption, depending on the thickness of the plaster layer and thermal conductivity. However, the thermal insulation effect of the plaster is much lower compared to the general thermal insulation. The calculated values of thermal conductivity are 0.87 W/(m · K) for lime-cement plaster and 1.4 W/(m · K) for cement plaster. In order to improve these parameters, it is necessary to partially or completely replace the ordinary filler in the plaster with a light filler (keramsite, expanded shale, pumice, perlite, vermiculite, air polystyrene).

Thermal insulation. High requirements for thermal insulation result in high requirements for external walls. The heat transfer coefficient of external walls should be from 0.3 to 0.6 W/(m · K).

In the first three columns of Tables 9 and 10, data on the relationship between thermal conductivity, wall thickness and heat transfer coefficient for plastered walls without thermal

insulation are presented as an example of German experience. These metrics can be used in a variety of ways.

For example: Wall thickness - S=36.5 thermal conductivity λ_R=0.21 W/(m ·K); need to find the heat transfer coefficient. It can be determined from the table that k= 0.51 W/m ^{2} ·K.

Thermal conductivity λ_R=0.21 W/(m ·K), heat transfer coefficient 0.51 W/(m² ·K), wall thickness - S should be found. It can be seen from the table that the thickness of the walls is S=30 cm.

Impact of noise, sound insulation

- One of the medical requirements for accommodation is compliance with the right of residents not to make excessive noise in their accommodation;
- sleep disturbance;
- psychovegetative and emotional impact;
- disturbance of rest inside and outside the room.

From a medical point of view, the noise level in the room should not exceed the values given in Table 9.

Sound insulation of external construction elements should be done accordingly, in which the local level of noise in an area of the building (table 11) should be reduced to the value recommended in sanitary regulations (table 10). The level of sound insulation of external elements is at the limit of technical and economic possibilities when building windows, taking into account the grill and opening window doors.

9 – table

Heat transfer coefficients (k) for different plastered exterior walls without insulating plaster and with insulating plaster 5-10 cm thick, as well as thermal conductivity coefficients of insulating plaster

Dial		Insulation on suvo q you wall	A wall with a lower layer of insulating plaster L_R=0.06; 0.08 and 10 W/K					
Thermal conductivity _ _ _	Take Q league		thickness of the insulating plaster is 5 cm (bottom layer).			The thickness of insulating plaster 10 cm (bottom corner)		
			L_R =0.06	L_R =0.08	L_R =0.10	L_R =0.06	L_R =0.08	L_R =0.10
L_R, W/ K	S _ cm	**k , W/(m² · K)**	**k , W/(m · K)**	**k , W/(m · K)**	**k , W/(m² · K)**	**k , W/(m² K)**	**k , W/(m² · K)**	**k , W/(m² · K)**
0.11	24.0	0.42	0.31	0.33	0.35	0.25	0.28	0.30
	30	0.34	0.27	0.28	0.29	0.22	0.24	0.25
	36.5	0.28	0.23	0.24	0.25	0.19	0.21	0.22
0.13	24.0	0.49	0.35	0.37	0.39	0.27	0.30	0.33
	30	0.40	0.30	0.32	0.33	0.24	0.27	0.28
	36.5	0.33	0.26	0.28	0.28	0.21	0.23	0.25
0.15	24.0	0.55	0.38	0.41	0.43	0.29	0.33	0.36
	30	0.44	0.32	0.35	0.36	0.26	0.29	0.31
	36.5	0.38	0.29	0.31	0.32	0.23	0.26	0.27
0.17	24.0	0.61	0.41	0.45	0.47	0.30	0.35	0.38
	30	0.51	0.36	0.39	0.41	0.28	0.31	0.34
	36.5	0.42	0.31	0.33	0.35	0.25	0.28	0.30
0.19	24.0	0.68	0.43	0.48	0.51	0.32	0.37	0.41
	30	0.56	0.38	0.42	0.44	0.29	0.33	0.36

	36.5	0.47	0.34	0.36	0.38	0.26	0.30	0.32
0.21	24.0	0.74	0.46	0.51	0.54	0.33	0.39	0.43
	30	0.61	0.41	0.44	0.47	0.30	0.35	0.38
	36.5	0.51	0.36	0.39	0.41	0.28	0.31	0.34
0.23	24.0	0.79	0.48	0.53	0.57	0.34	0.40	0.45
	30	0.66	0.43	0.47	0.50	0.32	0.36	0.40
	36.5	0.56	0.38	0.41	0.44	0.29	0.33	0.36
0.25	24.0	0.85	0.55	0.56	0.66	0.35	0.41	0.46
	30	0.71	0.45	0.49	0.53	0.33	0.38	0.42
	36.5	0.60	0.40	0.44	0.46	0.30	0.34	0.38
0.30	24.0	0.99	0.54	0.61	0.67	0.37	0.44	0.50
	30	0.82	0.49	0.55	0.59	0.35	0.41	0.45
	36.5	0.70	0.44	0.49	0.52	0.32	0.37	0.41
0.40	24.0	1.23	0.61	0.70	0.77	0.40	0.49	0.55
	30	1.04	0.56	0.63	0.69	0.38	0.45	0.51
	36.5	0.89	0.51	0.57	0.62	0.36	0.42	0.47
0.50	24.0	1.44	0.66	0.76	0.85	0.43	0.52	0.59
	30	1.23	0.61	0.70	0.77	09.40	0.49	0.55
	36.5	1.06	0.57	0.64	0.70	0.38	0.46	0.52
0.60	24.0	1.63	0.70	0.81	0.91	0.44	0.54	0.62
	30	1.40	0.65	0.75	0.83	0.42	0.51	0.59
	36.5	1.22	0.61	0.70	0.76	0.40	0.49	0.55
0.70	24.0	1.79	0.73	0.85	0.96	0.45	0.56	0.65
	30	1.56	0.68	0.80	0.88	0.44	0.53	0.61
	36.5	1.36	0.64	0.74	0.82	0.42	0.51	0.58
0.80	24.0	1.94	0.75	0.89	1.00	0.46	0.57	0.67
	30	1.70	0.71	0.83	0.93	0.45	0.55	0.63
	36.5	1.49	0.67	0.78	0.86	0.43	0.52	0.60
0.90	24.0	2.08	0.77	0.91	1.03	0.47	0.58	0.68
	30	1.83	0.73	0.86	0.97	0.45	0.56	0.65
	36.5	1.61	0.69	0.81	0.90	0.44	0.54	0.62
1.0	24.0	2.20	0.78	0.94	1.06	0.47	0.59	0.69
	30	1.94	0.75	0.89	1.00	0.46	0.57	0.67
	36.5	1.73	0.71	0.84	0.94	0.45	0.55	0.64

Notes (to tables 9 and 10):

1) To determine the values, the thickness of the outer plaster is 2 cm, λ_R =0.87 W/(m · K) and the thickness of the internal plaster is 1.5 cm, λ_R =0.70 W/(m · K). .

2) To determine the values, 1 cm l_R = 0.87 W/(m · K) from the upper layer of plaster and 1.5 cm l_R =0.70 W/(m · K) from the inner layer of plaster were taken .

10 - table

without insulating plaster and plastered (l_R =0.07 W/(m ·K) at different thicknesses of insulating plaster)

Dial		A wall without insulation	A wall with a lower layer of insulating plaster					
It's hot conductivity	Kalin league		5 cm	6 cm	7 cm	8 cm	9 cm	10 cm

L_R, (W/K)	S , cm	**k , W/(m² K)**	**k , W/(m ·K)**	**k , W/(m² K)**	**k , W/(m² K)**	**k , W/(m² K)**	**k , W/(m² K)**	**k , W/(m² K)**
0.11	24.0	0.42	0.32	0.31	0.30	0.28	0.27	0.26
	30	0.34	0.26	0.26	0.25	0.25	0.24	0.23
	36.5	0.28	0.23	0.23	0.22	0.21	0.21	0.20
0.13	24.0	0.49	0.36	0.34	0.33	0.31	0.30	0.29
	30	0.40	0.31	0.30	0.28	0.27	0.26	0.25
	36.5	0.33	0.27	0.26	0.25	0.24	0.23	0.23
0.15	24.0	0.55	0.40	0.38	0.36	0.34	0.32	0.31
	30	0.44	0.34	0.32	0.31	0.29	0.28	0.27
	36.5	0.38	0.30	0.29	0.27	0.26	0.25	0.25
0.17	24.0	0.61	0.43	0.40	0.38	0.36	0.34	0.33
	30	0.51	0.37	0.35	0.34	0.32	0.31	0.29
	36.5	0.42	0.32	0.31	0.30	0.28	0.27	0.26
0.19	24.0	0.68	0.46	0.43	0.41	0.38	0.36	0.35
	30	0.56	0.40	0.38	0.36	0.34	0.33	0.31
	36.5	0.47	0.35	0.34	0.32	0.31	0.29	0.28
0.21	24.0	0.74	0.49	0.45	0.43	0.40	0.38	0.36
	30	0.61	0.43	0.40	0.38	0.36	0.34	0.33
	36.5	0.51	0.38	0.36	0.34	0.32	0.31	0.30
0.23	24.0	0.79	0.51	0.48	0.45	0.42	0.39	0.37
	30	0.66	0.45	0.42	0.40	0.38	0.36	0.34
	36.5	0.56	0.40	0.38	0.36	0.34	0.33	0.31
0.25	24.0	0.85	0.53	0.50	0.46	0.43	0.41	0.39
	30	0.71	0.47	0.44	0.42	0.39	0.37	0.35
	36.5	0.60	0.42	0.40	0.38	0.36	0.34	0.32
0.30	24.0	0.99	0.58	0.54	0.50	0.47	0.44	0.41
	30	0.82	0.52	0.49	0.45	0.43	0.40	0.38
	36.5	0.70	0.47	0.44	0.41	0.39	0.37	0.35
0.40	24.0	1.23	0.66	0.60	0.55	0.51	0.48	0.45
	30	1.04	0.60	0.55	0.51	0.48	0.45	0.42
	36.5	0.89	0.55	0.51	0.47	0.44	0.42	0.39
0.50	24.0	1.44	0.72	0.65	0.59	0.55	0.51	0.47
	30	1.23	0.66	0.60	0.55	0.51	0.48	0.45
	36.5	1.06	0.61	0.56	0.52	0.48	0.45	0.42
0.60	24.0	1.63	0.76	0.68	0.62	0.57	0.53	0.49
	30	1.40	0.71	0.64	0.59	0.54	0.50	0.47
	36.5	1.22	0.61	0.70	0.76	0.40	0.49	0.55
0.70	24.0	1.79	0.73	0.85	0.96	0.45	0.56	0.65
	30	1.56	0.68	0.80	0.88	0.44	0.53	0.61
	36.5	1.36	0.64	0.74	0.82	0.42	0.51	0.58
0.80	24.0	1.94	0.75	0.89	1.00	0.46	0.57	0.67
	30	1.70	0.71	0.83	0.93	0.45	0.55	0.63
	36.5	1.49	0.67	0.78	0.86	0.43	0.52	0.60
0.90	24.0	2.08	0.77	0.91	1.03	0.47	0.58	0.68
	30	1.83	0.73	0.86	0.97	0.45	0.56	0.65
	36.5	1.61	0.69	0.81	0.90	0.44	0.54	0.62
1.0	24.0	2.20	0.78	0.94	1.06	0.47	0.59	0.69

	30	1.94	0.75	0.89	1.00	0.46	0.57	0.67
	36.5	1.73	0.71	0.84	0.94	0.45	0.55	0.64

11 – table

Basic noise level in residential areas
(In the case of the German experience)

Room type, area	Recommended noise level	
	during the day	at night (from 22.00 to 7.00)
When a bedroom window is open (regardless of local regulations)	30dB(A)	25dB(A)
In the accommodation rooms	45dB(A)	35dB(A)
On gardens, porches, etc	35dB(A)	18 B (A)

12 - table

Noise level with closed shutters (in accordance with recommendations of the Association of German Engineers 2058, 1973)

Territory	Road noise level	
	during the day	at night
In industrial areas	70 dB(A)	
The amount of industrial facilities is in areas where coppice is infested	65 dB(A)	50 dB(A)
In ordinary residences	55 dB(A)	40 dB(A)
In residential areas (arrays)	50 dB(A)	35 dB(A)
In spa and sanatorium areas, as well as in hospital areas	45 dB(A)	35 dB(A)

Sound insulation of internal building elements is a matter of personal needs of residents, their habits, age structure of the family, mental and physical condition of each individual. In addition, changes may occur over time and the function of some rooms may change.

There is a basic rule in the design that quiet rooms (for example, bedrooms) should be placed next to the buildings, and noisy rooms (residential rooms) should be placed next to the noisy rooms. Buffer zones (corridors, bathrooms, toilets) should be placed between quiet and noisy rooms. Therefore, there are different requirements for sound insulation and insulation from impact noise for different walls and ceilings in residential buildings, which the guest should agree with the owner of the house during the design process and determine together with him.

Fermacell plate

The German "Fermacell" board consists of paper pulp fibers and gypsum obtained during the secondary processing of paper pulp. The two natural raw material components are mixed and, after dewatering, pressed into stable sheets under high pressure without the use of binders, then dried, impregnated with water repellants, and cut into shapes of the required size.

In an aqueous environment, gypsum attracts fibers. This gives Fermacell plates strength and resistance to wear. Due to their composition, these plates can be used both as construction and anti-fire and moisture-resistant plates.

Physical properties of Fermacell plates in construction

Sound insulating properties

Tests conducted in various institutions have confirmed that Fermacell tiles have very high sound insulation properties. In the process of testing the walls and ceilings made using these plates, the level of sound insulation reaches 86 dB, the level of sound insulation from impact noise is improved up to 16 dB (in light ceilings) and up to 24 dB (in massive ceilings).

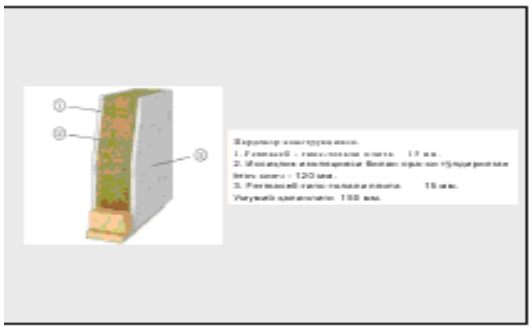
Yongpin protective properties

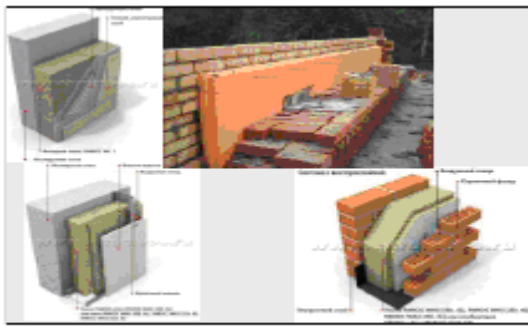
Thickness 10; 12.5; 15 and 18 mm coated Fermacell plates are approved for use by the Institute of Construction Technology in Berlin as a non-combustible building material according to the DIN 4102 (Part 1) standard based on RA III.4.6 test reports.

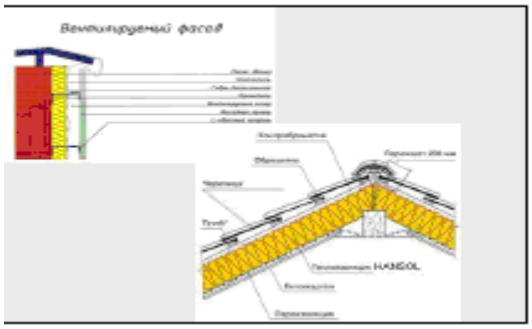
It was carried out in German and European laboratories for the testing of wall constructions and task constructions for the tolerance class of materials from F 30 to F 120.

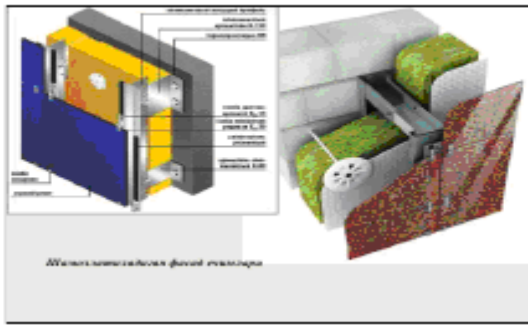
Sound insulation

are 0.36 W/m K when ·the diffusion resistance coefficient is 11 and the density is 1.180±50 kg/m 3 ·









- Mapruza	Modern decorative building materials

(map-2 hours)

1.1. Mapruza carrying technology

Washing time: 2 hours	Number of students: 50
Training form	Informative mapruza
Mapruza plan	1 ***Aquapanel*** 2 **Gypsum and gypsum plaster materials and products** 3
5. The purpose of the workshop: To acquaint students with information about modern decorative construction materials .	
pedagogical tasks:	*Results of training activities:*

Provides general information about modern decorative building materials .	In Mapruza, they gained an understanding of the general information about modern thermal insulation materials
Introduces mineral thermal insulation materials with a fiber frame .	They get acquainted with mineral thermal insulation materials with a fiber frame
It provides information on the finding of thermal insulation materials made from gas .	Heat insulation materials made from gas can be explained in the article.
It provides information on the application of foamed mineral thermal insulation materials .	They will find out at the site of foamed mineral thermal insulation materials
Provides information on finding organic thermal insulation materials .	They will find out in the organic thermal insulation materials
Provides information on additional insulation of various structures .	They will learn about different constructions in the bag insulation test
Cleaning tools	Lecture text, blackboard, computer, projector, slides.
Cleaning methods	Informative mapping, blitz-soprov, brainstorming,
Whitening forms	Work in a team.
Bleaching conditions	An audience that can be covered by technical means and a method of working in groups.
Monitoring and evaluation	Oral questions.

Technological map of the theme of providing an understanding of modern decorative building materials

Work steps	The content of the teacher's activity	The content of the listener's activity
Stage 1 Introduction to the topic (10 min)	1.1. Explains the topic, plan and results of training activities. 1.2. Asks questions to enliven the topic. (Appendix 1).	They listen. They answer questions. They listen.
Stage 2. My main focus (70 min)	2.1. Mapruza turns white (Appendix 3). 2.2. Asks questions to strengthen Mapruza. (Appendix 4)	They listen and write. They listen and answer.
Stage 3 My main focus (70 min)	3.1. Mapruza turns white (Appendix 3). 3.2. Asks questions to strengthen Mapruza. (Appendix 4	They listen and write. They listen and answer.
Stage 3. Finisher (10 min)	3.1. Makes final conclusions about the training. 3.2. He asks questions to prepare for the next topic. (Appendix 5).	They ask questions. They listen and write. They write.

Modern decorative building materials

Aquapanel - this is a universal environmentally friendly building material with a rectangular shape and thickness. Such plates are currently produced at the Germani (Izerlon city

) and Gretsi (Volos city) enterprises of the Knauf USG Systems company . The production was carried out in cooperation with the German company Knauf Gips KG and the United States Gypsum Company (USG).

According to the structure of the panel, Akvapanelgp consists of a mineral filler and cement, and a fiberglass top covering both sides of the plate (Fig. 68).

the two sides of the plate are cut, and due to the topography of the two edges, they can be glued together. This increases the water resistance of the base and the quality of seams.

http://www.esp-group.ru/stroy/gips/articles/img/big/aqua_struct.gif

Akvapanelgp is universal, resistant to water damage, does not rot and rot, and is resistant to fungus and mold due to the fact that it is made on the basis of portland cement and mineral filler .

Fastening of these panels is done using screws on metal or wooden clinches, similar to Knauf plasterboard fastening systems.

These plates are produced in two types: for outdoor and indoor use.

production of slabs is carried out with the help of a conveyor, and the entire canvas is molded from light concrete covered with glass fabric on both sides. liquid portland cement paste is sprinkled on both sides of the plate. the width of the canvas determines the width of the slab.

Akvapanelgp plates of the required size are cut from ready-made lightweight concrete strips. The front side of these plates is smooth, and the back side is rough. Properties of Akvapanelgp sheets are presented in table 13.

13 – table

Technical properties of aquapanel

Copies	External	Internal
Length , mm	1200 or 2500	1200
Width , mm	900	
Thickness , mm	12.5	
Weight , kg/m ^{2}	~16	~15
Density , kg/m ^{3}	~1200	~1050
Bending strength, not less , Mpa	10	7
Heat conductivity coefficient , W/m·K	0.32	0.27

Gypsum and gypsum plaster materials and products

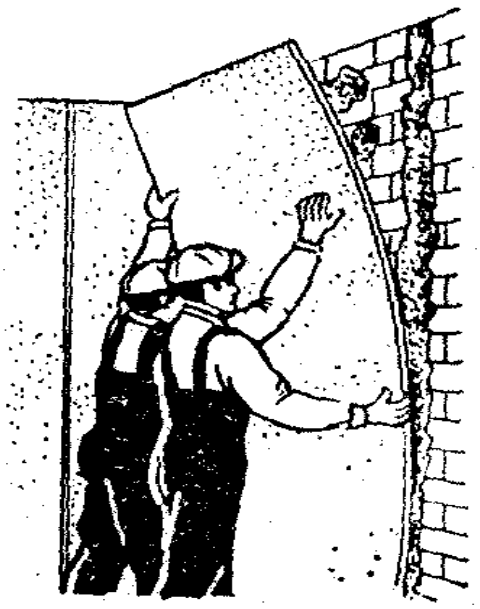
Gypsum products are made from gypsum paste. A small amount of fine mineral or organic fillers is added to the gypsum paste to improve the properties of the products .

Gypsum- concrete are unfired artificial stone materials and products made on the basis of gypsum , anhydrite and gypsum-cement-putsts- oil plasterers (GTSPV). For gypsum-concrete, gypsum and non-aqueous pore fillers - mineral (fuel and blast furnace slag , slag and other) and organic (sawdust, crushed wood , reeds , etc. scales) fillers are used.

Gypsum and gypsum-concrete products have sufficient strength, low thermal conductivity and high heat protection properties if the average density is relatively small . In addition , they are well machined and easily painted . But the water resistance of the products under consideration is low, but the water resistance of materials made on the basis of GTSPV is high .

A sufficiently wide nomenclature of gypsum and gypsum-concrete products is used in modern construction : gypsum cardboard sheets , slabs and panels for fences, panels for flooring and others . .

Gypsum-cardboard sheets are made of building gypsum with mineral or organic additives (or without them) and are made of a finishing sheet material glued on both surfaces with cardboard .



37-rasm. Devorlarni gips qoplama listlar bilan qoplash

Sheets are fixed to the flat surface using gypsum glue , foam gypsum and other mastics (Fig. 2). When plasterboard is used instead of the usual wet water, finishing works are accelerated .

Gypsum boards for walls it can be gypsum or plaster of paris , they are produced as solid and hollow 400-800 mm wide, 80-100 mm thick. The right surface of the plates is smooth or rough. Their density is 1000-1300 kgG'm ^{3} , compressive strength is 3-4 MPa, moisture content is 8% by mass . They have good thermal , hygroscopic , heat and sound protection properties . _ _ _ _ Pardev o r plates are regularly used for construction of non - retaining facades of residential and industrial buildings that do not get wet.

Gypsum-concrete panels *are used* in industrial construction to build self-supporting walls , as well as for floors and other purposes .

The panels used for fencing are made of flat plates, the length of the room or part of the room, the width is equal to the height of the floor , and the thickness of the panel is usually 80-100 mm. They can be chests or made with room for doors .

Gypsum-plaster panels are made by the method of continuous molding in prockets or cassettes . The process of preparing the panels in the sawmill is to lay the prepared gypsum concrete mixture on the rails, mold the panels , keep them to hold the plaster , and then edge the panels for transportation to the drying chambers and then to the warehouse . Learn to lift and move .

The moisture content of the finished panels should be no more than 8%, and the strength of gypsum concrete should be at least 3.5 MPa, and their density should be 1250-1400 kgG'm ^{3} . The quality of plasterboard panels is determined by inspection and control measurements .

Panels intended for floors are made from plaster of paris made with gypsum - cement - putsts and are reinforced with wood planks . The panels have a thickness of 50-60 mm and the dimensions of the length and width are designed for a room or a part of a room when the house is large . The moisture content of floor panels after leaving the drying chamber should not exceed 10% , the compressive strength of gypsum concrete in the dry state is at least 7 MPa, when saturated with water is 4 MPa, and the density is at least 1300 kgG 3 . _ The quality of their surface should be such that it is possible to cover with linoleum , tiling or mastic materials without additional costs .

Panels designed for sanitary-technical cabins and ventilation for communications in residential buildings made of plaster -concrete on the basis of GTSPV , as well as external one - story residential buildings in rural areas . wall panels are prepared.

Glass magnesium board (glass magnesium board) is a sheet coating material that is recommended for use instead of plasterboard, gypsum fiber or OSB boards.

The main constituents of this material are magnesium oxide (MgO) 40-50%, magnesium chloride ($MgCl_2$) 30-35%, perlite (SiO_2, volcanic glass, as a sound insulating material in the material) 3-8%, sawdust - Up to 15%, water, fiberglass, polypropylene fabric. The resulting pressed adhesive mass is placed in the hopper of the moving molder, which is equipped with special molds and estimates the thickness of the sheet. A layer of glass fabric and polypropylene

is spread on a flat surface. Then, the adhesive mass is evenly poured over them using a moving hopper. Polypropylene layer and glass fabric are spread on it. A roller is rolled over the entire surface of the poured mass, so that all layers adhere well. Then, with the help of an automatic cutting machine, the boards are cut to the required size and sprinkled with sawdust to prevent them from sticking together.

Cut leaves are soaked in water and °dried at a temperature of about 30 C. Long-cut processing is completed by polishing the back side of the sheets and shaping the edges (Fig. 67).

Technical characteristics of fiberglass sheets :

• color - white , gray , light yellow ;
• size , mm – 1200x2400, 1220x2440, 1220x2500, 1200x2500;
• thickness , mm – 3, 4, 5, 6, 8, 10, 12, 14, 16, 18, 20;
• density , g/cm ^{3} – 0.7 – 1.1;
• flammability group – NG ;
• natural humidity , % – 9 – 11;
• dry bending strength , Mpa - 6 - 20;
• wet bending strength , Mpa - 5 - 25;
• water absorption by weight , % - 20 - 40;
• penetration during construction , % – <0.3;
• coefficient of thermal conductivity , W/m · K – 0.2 – 0.5;
• resistance to cold , cycles - 20 to 50 hours;
• impact strength , kDj/k.kv - 1.5 - 3.5;

8 - Lecture _ _	***Modern tompop materials .***

(map-2 hours)

1.1. Mapruza carrying technology

Washing time: 2 hours	Number of students: 50
Training form	Informative mapruza
Mapruza plan	1. Basic classifications. 2. Tiled coatings. 3. Coverings from metal sheets. 4. Sheets with mirrors. 5. Soft tomboy material
1. ***The purpose of the training course*** : ***Modern tompop materials*** introducing information about .	
pedagogical tasks:	*Results of training activities:*
The main tasks of modern tombop materials provide information.	The main functions of modern tombop materials They have an understanding in their findings
Introduces ceramic coatings .	They get acquainted with ceramic coatings
Provides information on finding metal sheet coatings .	They will be able to explain in the sheet metal coating finder .
Sheets with mirrors	Mirrors will find out in the finder list
Soft tomboy material gives information on finding	Soft tomboy material they will find out
Provides information on cleaning tools	Lecture text, blackboard, computer, projector, slides.
It provides information on cleaning methods	Informative mapruza, blitz-soprov, brainstorming
Whitening forms	Work in a team.
Bleaching conditions	An audience that can be covered by technical means and a method of working in groups.
Monitoring and evaluation	Oral questions.

Technological map of the topic of *modern tompop materials*

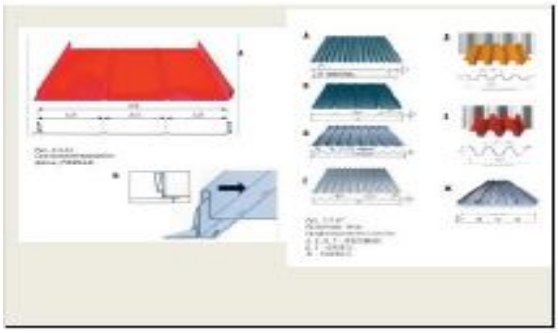
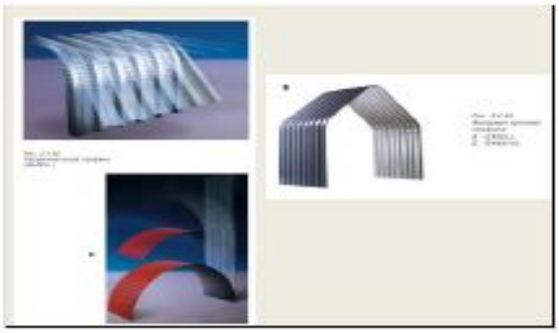
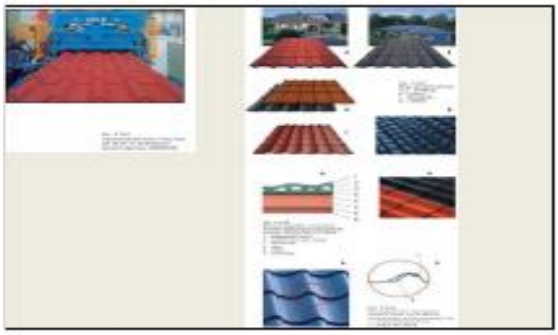
Work steps	The content of the teacher's activity	The content of the listener's activity
Stage 1 Introduction to the topic (10 min)	1.1. Explains the topic, plan and results of training activities. 1.2. Asks questions to enliven the topic. (Appendix 1).	They listen. They answer questions. They listen.
Stage 2.	2.1. Mapruza turns white (Appendix 2).	They listen and write.

My main focus (60 min)	2.2. Asks questions to strengthen Mapruza. (Appendix 3)	They listen and answer.
Stage 3. Finisher (10 min)	3.1. Makes final conclusions about the training. 3.2. He asks questions to prepare for the next topic . (Appendix 6).	They ask questions. They listen and write. They write.

Modern tompop material

Clay tile is a construction material in the form of angular tiles or rods, which are molded from clay and then baked (Fig. 6). The roof is covered with it. In terms of cheapness, durability and quality of hospitality, they are not inferior to other materials.

Stamped shingles, strip shingles with a cup, strip flat shingles, and roof shingles are used.


9- Mapruza	***Modern popular materials .***

(map-2 hours)

1.1. Mapruza carrying technology

Washing time: 2 hours	Number of students: 50
Training form	Informative mapruza
Mapruza plan	1. Basic classifications (coverings for the floor surface, new technologies of laying the floor, foundations for the floor). 2. Warm floors. 3. Cast floors. 4. parquet floors. 5. Gypsum fiberboard floors. 6. cork flooring. 7. Laminate flooring. 8. Laminate floors. 9. Linoleums. 10. Cavrolins.
The purpose of the training course is to familiarize students with information about **modern materials .**	
pedagogical tasks:	*Results of training activities:*
Main classifications (coverings for the floor surface, new technologies of laying the floor, foundations for the floor) gives information on finding.	In Mapruza, they will learn about the main classifications (coverings for the floor surface, new technologies of laying the floor, bases for the floor). .
Introduces warm floors .	They get to know warm floors and find out
Provides information on finding cast floors .	Cast floors . they will find out
provides information on finding parquet floors .	they will find out when finding parquet floors
Provides information on finding floors from gypsum-fiber boards .	Gypsum-fiber floors will be found in the foundry
provides information on finding cork floor coverings .	they will find out about cork floor coverings
Provides information on finding laminate flooring .	Find out about laminate flooring
Falgpsh provides information on finding floors.	Falgpsh will find out at the floor finder
Provides information on finding linoleums . gives information on finding.	Find out about linoleums
Cavrolins	Cavrolins
Cleaning tools	Lecture text, blackboard, computer, projector, slides.
Cleaning methods	Informative mapping, blitz-soprov, brainstorming,
Whitening forms	Work in a team.
Bleaching conditions	An audience that can be covered by technical means and a method of working in groups.
Monitoring and evaluation	Oral questions.

Modern polbop materials **technological map of the topic of giving an understanding of.**

Work steps	The content of the teacher's activity	The content of the listener's activity
Stage 1 Introduction to the topic (10 min)	1.1. Explains the topic, plan and results of training activities. 1.2. Asks questions to enliven the topic . (Appendix 1).	They listen. answer questions . They listen.
Stage 2. My main focus (60 min)	2.1. Mapruza turns white (Appendix 2). 2.2. Asks questions to strengthen Mapruza. (Appendix 3)	They listen and write. They listen and answer.
Stage 3. Finisher (10 min)	3.1. Makes final conclusions about the training. 3.2. He asks questions to prepare for the next topic. (Appendix 4).	They ask questions. They listen and write. They write.

Modern polbop materials
P o larga closing materials

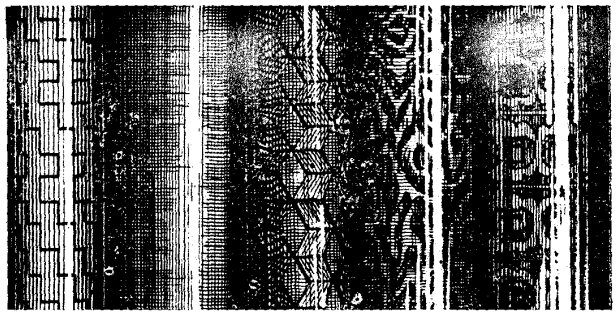
Currently , polymer wrap and tile materials are widely used to cover floors in construction . In addition, they are used to cover seamless floors .

Polymer materials are several times lighter than wood and earthen boards , they are strong, stable and meet hygiene requirements , as well as beautiful appearance and less water absorption . Floors covered with packaging materials are economical and meet the requirements of construction industry .

Floor covering *materials* are made on the basis of various synthetic polymers with the addition of fillers , plasticizers and pigments. They are divided into linoleum and synthetic carpets . Depending on the type of primary polymer , linoleums are divided into polyvinylchlorid , glyphtal, colloxylin rubber and other linoleums , which are non - based and strengthen or heat and t basic , single-layer and multi-layer, smooth, wavy and hairy according to the texture of the right surface (for carpet coverings) , single - colored and blue according to the surface color p are divided into colored lin o leums.

Polymer packaging materials for covering floors have good corrosion resistance , low water absorption , high elasticity and other good properties . The right surface of the linoleum should be smooth, shiny white or semi-glossy white , without spots , scratches, crushed places , voids and pitted places . Lin o leum of the same color should be flat and uniform in color over the entire surface. Multi-colored lin o leum is deeply painted, that is, the image should pass through the entire thickness of the edible layer, it should be clear. The color of linoleum should not change under the influence of light, air and water .

Lin olium packages are stored upright in dry rooms at a temperature of at least 10 ^{0} C. If the linoleum paste is supplied with each other , it should be kept unopened for 1 day in the refrigerator . The linoleum should be spread out to eliminate the ripples that occur when the bedding is stored in rolls for a few days .



53-расм. Polivinilxlorid linoleum o'ramlari

Polyvinyl chloride is made with or *without* aluminum *mat* base (Fig . *53*) . Lin olium without material can be single , double and multi-layered. In addition, porous or felt - based thermal insulation linoleum is produced .

P o livinilxl orid lin olium is produced in the form of a mat with a length of at least 12 m and a width of 1200-1600 mm . The thickness of lin o lium is 1.2-6 mm. In terms of color, it can

be monochromatic (various colors), marble and gold .

Polyvinylchlorid linoleum is suitable for the floors of public and industrial buildings with intensive pedestrian traffic . _ _ _ _ _ _ It is not recommended to cover the floors in rooms with high humidity with linoleum prepared by placing a mat on the base .

Linoleum (non-based and made on the basis of fabric) is glued using bituminous rubber, kumar o n rubber and other soft mastics , KN-2, KN-3 glue and others (54 - picture). The edges of the polyvinyl chloride or linoleum are welded with a special tool in order to ensure a complete adhesion of the linoleum and to create a hermetically sealed seam .

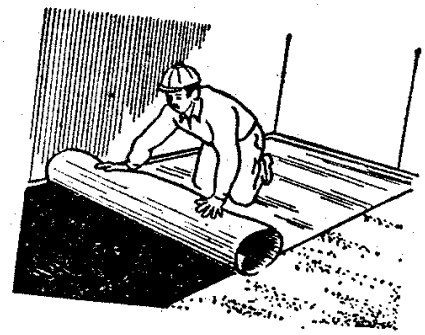


Figure 54. Lin o lium is pasted in fresh mastic

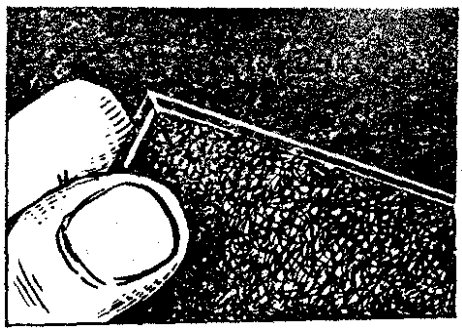


Figure 55. Lin olium prepared in the form of felt

Polyvinyl chloride or linoleum , prepared on the basis of heat - resistant chemical properties , is the most industrial type of coating in the construction of many houses based on the method of using ready-made steel- concrete details . The two main types of this type of linoleum - felt (Fig. 55) or made on a foamed synthetic basis - have high requirements for smoke protection (from impact noise) and heat absorption . It is used to cover floors in living rooms, residential buildings , hotels , public buildings and other rooms with normal humidity conditions . In recent years, felt-based polyvinyl chloride is cut and welded at the factory and delivered to the construction site as a room - sized carpet . They can easily be laid on reinforced concrete panels of inter - floor coverings .

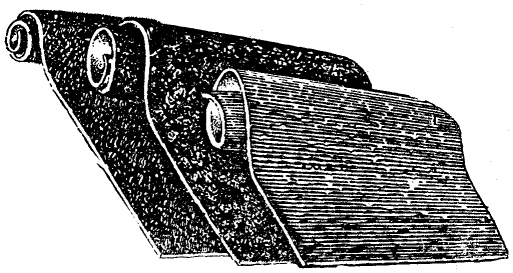
Glyphtal (alkyd) linoleum mat is produced in the form of a mat with a length of at least 20 m, a width of 1800-2000 mm and a thickness of 2.5-5 *mm* . It can be monochromatic (different colors) or colorless (colorful) . Its thermal insulation properties are slightly higher than those of polyvinyl chloride or linoleum . _ _ _ _ Glyphtal linoleum serves to make floors in auxiliary buildings .

A non - colloxylin (nitrocellulose) linoleum - based *packing* material . _ _ _ It is produced in rolls 20 m long, 1000-1600 mm wide and 2-4 mm thick. The color of linoleum is usually a subtle red or brown color . This linoleum is resistant to light, moisture and heat , has great elasticity and flexibility, eats little, does not emit volatile compounds. But among its disadvantages, it is necessary to include the insufficient properties of heat protection , therefore , colloxylin linoleum is used only in auxiliary buildings .

Rubber linoleum (relin) is a two-layer packing material, in which, as the main laying layer, crushed old rubber and petroleum bitumen with a small amount of vulcanized waste from asbestos and yarn fibers are added. mixture is used . The very thin (1-1.5 mm) and strong upper surface layer of Relin consists of colored rubber with filler made on the basis of synthetic rubber .

Relin rolls are at least 12 m long, 1000-1600 wide and 3 and 5 mm thick. Relin thickness is 4-6 mm and it is also made on a porous base that protects against heat . The surface of the rail is like marble with a smooth color, the same color or different colors . It is elastic, resistant to water, acid and alkali , as well as resistant . Relin floors do not accumulate static electricity and thus exclude the possibility of sparking . Relin is used for making floors in utility rooms , public and industrial buildings , as well as in rooms with high operational humidity .

synthetic carpet made on the basis of foamed latex is a two-layer wrapping material, in which the upper layer is made of corrosion-resistant polyamide (capron) fabric , and the base is made of foamed natural or made of synthetic latex (Fig. 4).



56-rasm. Tukli sintetik gilamlar

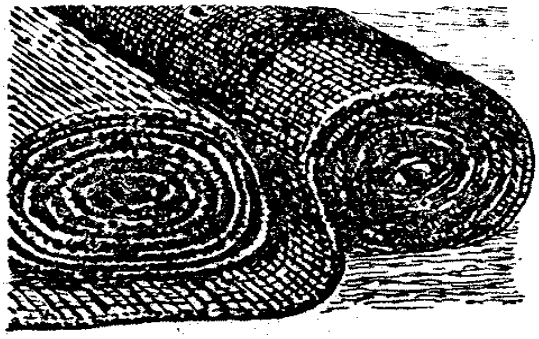
the carpet covering is 8 mm, the height of the capr o n hair is 3 mm, and the height of the foamed latex base is 5-6 mm. The pile carpet is made in the form of mats with a length of up to 12 m, a width of 1000-4000 and a thickness of 8 mm . They are rolled up. Feather color can be different.

fluffy synthetic carpet is characterized by high acoustic and thermal insulation properties , it is resistant to corrosion and other mechanical effects, it can be wet cleaned . The pile of such a carpet does not burn, it just melts.

It is dry-laid on a ready-made synthetic base with a width equal to the size of the room and fixed with a plinth with a special profile along the perimeter of the room. This leads to the cost of laying them down .

Synthetic pile carpets are used for floors in reading rooms , audit rooms , guest rooms , concert halls and similar places .

Tufting - non - woven carpets are very common due to their simple and inexpensive technology . They are made of a wide mat or a single layer of white or sheared hair up to 450 cm wide .



57-rasm. Tukli linolium o'ramlari.

Needle felt carpets are a wrapping material made of one or more layers of fibers . The thickness of felt carpets is 2-6 mm.

Woolen linoleum is a two-layer non-woven wrapping material, the upper *layer of which is* made of synthetic (polypropylene) yarn, *and the* outer layer *of* white wool is made of polyvinyl chloride . a veiled base is felt (Fig. 5 7) . 12-20 m long , 1000 m wide and 4-6 mm thick sheet of wors oil is rolled and delivered to the construction site . The coat has different colors depending on the color of the white fur .

Warsaw wool is characterized by high absorption of flavor , good heat preservation qualities, resistance to eating and can meet hygiene requirements . One mat of Warsaw, glued together , makes a carpet of the same size as the room . It can be dry-laid on iron-concrete panels of free-standing areas and fixed with pilintus along the perimeter. Floors in buildings with high acoustic and heat - technical requirements are covered with varsoline .

Plate materials. Currently , various tile materials based on synthetic polymers , plasticizers , fillers and pigments are widely used for covering floors . Tiles allow you to create very different pictures . Their gluing and replacement is easy and requires less labor, less polymer is used for production compared to the production of similar packaging materials . It is also easy to transport and store. When making floors from tiles , there is practically no material waste, the floors serve for a long time, are chemically stable and eat less, but due to the large amount of dust , they do not

meet the hygiene requirements . It is stronger and more labor-intensive than paper made from rolls .

the type of raw material, floor covering tile materials are divided into polyvinyl chloride , rubber and rubber materials.

Polyvinyl chloride tiles are made in the same color or marble color , 300x300 and 200x200 *mm sizes and 1.5-3 mm thickness.* They are resistant to water, acids and weak solutions of mineral oils , besides , they have a great effect on corrosion, crushing , high flexibility and availability . characterized by The disadvantage of polyvinyl chloride tiles is the low thermal properties .

It is recommended to use polyvinyl chloride tiles in kitchens and utility rooms of residential and public buildings , as well as in domestic and some production rooms of industrial buildings . It is best if the base on which the ply -nilxl road is laid is made of wood planks or wood planks .

Kumar o n tiles are produced with a thickness of 3-4 mm and sizes of 300x300 and 200x200 mm. They are sufficiently strong, water resistant, have good resistance to corrosion and crushing, meet hygiene requirements and are chemically stable, but have low heat protection properties . These tiles are used to cover the floors in corridors of public buildings , as well as in busy rooms . It is not recommended to use the same type of tiles in rooms where the production mode is humid and hot .

Rubber tiles are made from the relin inserts , sizes 300x300 and 500x500 mm, thickness 3.5 and 10 mm. They are resistant to water, acid , heat and heat , low heat and sound conductivity, corrosion resistant, flexible and elastic . Coverings made of rubber tiles sufficiently meet hygiene requirements , are economical to use, and have a good scenic appearance.

59-rasm. Plitkalarni sovuq mastikada yopishtirish.

Rubber tiles are designed for covering floors in industrial and public buildings , as well as wet rooms .

To glue the tiles, bitumen-rubber or kumar o n rubber mastics are used. The mastic is applied to the floor and the back of the tiles with a thickness of 0.5 mm using a toothed spatula . After the mastic is applied, the tile is brought to the place where it will be laid, and it is placed on the mastic layer (Fig . 6).

Polyvinylchlorid tiles are delivered to the construction site in bundles with KN-2 glue , which ensures good adhesion of the tiles. After laying the tiled floor , it is necessary to immediately clean the surface of the tiles from mastic residues and drops using solvents (acetone , gasoline and others) , and then use colorless pastes to make the floor shine . it is recommended to cover with

Materials for seamless solid floors . Seamless solid floors are made by applying one or more layers of mastic compounds to the base . The synthetic components of mastic compositions are made of fillers , fillers and pigments. Urea , polyester and other resins are used as fillers . _ _

When making solid floors, there should be no lumps , lumps, holes and bumps in the floor covering, and the color of the covering should be uniform. Seamless integrated floors are durable , resistant to corrosion, elastic, meet hygiene requirements , have a good appearance and are easy to operate.

Depending on the initial materials, seamless integrated floors are divided into polyvinyl acetate, poly - cement , and plastic concrete floors .

Polyvinyl acetate floors are made in public buildings and rooms of the light , food and hardware industries , because the *floor* according to the production - technological regime high demands are placed on its quality . The same type of coatings cannot be used for floors in rooms with a high humidity regime , as well as in industrial buildings that have a heavy impact on the floor .

Poly - cement and plastic- based coatings have high strength, bite well with a corrosion - resistant base , are waterproof and meet hygiene requirements . In the rooms of public and industrial buildings with high usage (passage) , as well as in places that may be affected by mineral oils if it is used, it will be suitable for the purpose .

polbop ceramic tiles must also be impact-resistant and non-corrosive. They are divided into two types: ceramic tiles and tiles (patterned tiles). water absorption of tiles does not exceed 4%, elasticity should be 0.25 g/cm ^{2} .

All natural stone materials used for finishing facades can have a certain degree of porosity and in some cases have various small lines that cannot be seen with a knife. Over time, this make-up material softens and begins to fall off. Such a problem can be solved by finishing the building with smooth polished ceramic granite.

The history of ceramic granite dates back to the late 60s of the 20th century, and after a few years, this material began to be widely used.

This material is distinguished by its unique quality, resistance to acid and alkali. Another unique quality of ceramogranite is its hardness (7-8 on the Mohs scale) and its high corrosion resistance.

Keramogranite is an environmentally friendly material, its water absorption is 0.1-0.2% by mass. It can be used not only for internal and external walls, but also for finishing ventilated facades, open balconies and verandas. Its physical and mechanical properties are high, and its advantages are as follows:

- high compressive strength;
- durability;
- low moisture content (hardly absorbs moisture);
- resistance to temperature changes;
- high frost resistance;
- resistance to the aging process under the influence of time and ultraviolet rays;
- homogeneity of composition in terms of surface and volume;
- the availability of production in a wide range of colors and different sizes (Fig. 9).

As a disadvantage of ceramogranite, its flexibility similar to glass structure and low bending strength can be pointed out.

Carpet copy-mosaic tiles (carpet copy ceramics) are made of small-sized thin glaze-coated or uncoated pieces glued to a paper base in the form of a carpet. The surface of the tiles can be transparent or opaque, glossy or non-glossy, white or colored glaze. They can be covered with glazes that give the appearance of "berezka", "mimosa", "malachite" and other natural materials.

A special bone glue is applied to the surface of the carpet-mosaic tiles, and they are delivered glued and rolled into a paper bag, which is used to make a bag or bag. the seams between the tiles can be vertically and horizontally arranged linearly or chaotically (Fig. 10). Currently, polypropylene tops are used instead of paper. After the tiles are placed in place, they can be treated with hot water to remove dirt or dirt from the surface of the tiles.

There are also types of ceramic materials, such as ceramic pipes designed for sewage, sanitary-technical products.

The problems of water supply and sewerage existed in ancient Egypt and Mesopotamia. Complex types of sanitary-technical devices were created in ancient Egypt and Rome. In terms of complexity, they did not lag behind modern constructions. The next development of sanitary technology came to England and France in the 18th century. Toilets with toilets were invented at that time. The production of sanitary tiles - bathtubs, sinks, toilets has started. They were made from white plastic clay, kaolin, quartz and feldspar and baked at high temperature. Later, the production of such items began in Germany.

In the preparation of the product, the finished clay is poured into plaster molds. Then the dried product is covered with a light soluble glaze containing clay.

Sanitary-technical products are divided into porcelain and semi-porcelain groups (toilet, umivalgpnik) (Fig. 11). Currently, they are made from high-quality raw materials.

All sanitary items are coated with glaze to give them the necessary properties and improve their appearance.

Sanitary-technical products are characterized by decorativeness, smooth surface, easy cleaning and long-term retention of useful properties.

The disadvantage of these items is their flexibility. Despite this, sanitary ware made of porcelain is still the best and most modern product.

The diameter of the pipes is 150-600 mm, the ceramic is dense, the particles are united, the surface and the inside are glazed. These are made in special presses by fire-resistant or difficult-to-melt plastic clay (sometimes quartz sand). Pipes withstand 2 atm hydraulic pressure.

Optical resistant materials are also made from ceramics. These are dynas, fireclay, magnesite, dolomite, and chrome products. Opt-resistant materials are used to build constructions resistant to high (100-1750 ^{0} C) temperature effects.

Or wood - types of parquet

Wood materials that have preserved the natural physical structure and chemical composition of wood are called wood-board materials. They are divided into unprocessed (round) and processed (sawed building materials, wood-board materials, veneers, etc.) materials.

Parquet made in pieces is wooden planks of various sizes and shapes, with serrated and profiled edges and ridges. Planks are made from hardwood species (oak, beech, shumtol, birch, tilogoch, etc.). The length of the planks is 150, 200, 250, 300 and 400 mm, the width is from 30 to 60 mm, the thickness is 15 and 18 mm. Various patterns are created on the parquet floor by combining the planks in different ways (Fig . 6).

Dry white parquet consists of planks made of parquet planks glued to thick paper . The dimensions of the boards are 400x400 and 600x600 mm, the thickness of the oak and beech boards is 8 mm, and the thickness of the pine and larch boards is 12 mm . It is removed together with its glue .

Wooden parquet consists of a base made of boards and brushes , to which parquet planks are glued. By gluing planks to the color of wood, its texture and their mutual location, it is possible to create different shapes of parquet floors (Fig. 8) .

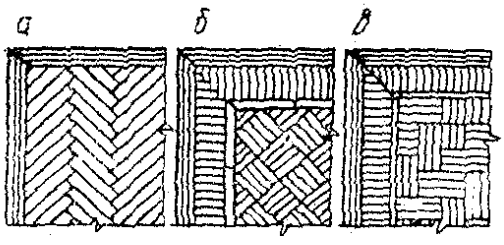
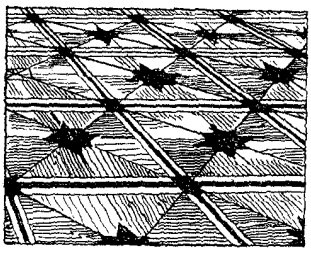
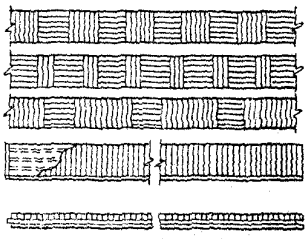


Figure 32. Floor painting made of parquet without a-frieze; b-frieze and slatted; v-frieze and striped



33 . Shit parquet



34. Parquet floor

Parquet boards are carpentry products with a corrosion-resistant outer coating, glued to a base made of slats with water-resistant adhesives (Fig. 32). In order to connect the boards to each other , a groove and groove are made along its perimeter . Parquet boards are made in length 1200, 1800, 2400, 3000, width 160, thickness 25 mm. The upper layer is collected from hardwood species (oak, beech and other) and coniferous species (pine tongue trees , width 20,25, and 30,

mm). The base of the parquet board is made of pine, black pine , tongue wood , birch, alder and other wood planks .

Concrete parquet board is one of *the* new types *of* parquet boards . The planks of its varnished upper layer are arranged in a checkerboard pattern in the form of a square or rectangle . The length of the boards is 2425, the width is 100 and the thickness is 17.5 mm. High - quality parquet boards are made on specialized technological lines . These boards are considered the best material for wooden floors of residential and public buildings and meet the requirements of construction industrialization . When flooring from parquet boards, labor is spent one time less than flooring from artificial parquet . In addition, such floors are more hygienic , because there is practically no gap between the top cover boards and the boards .

Carpentry boards are slats glued on one or two sides of *plywood* or veneer . Carpentry boards are 2500 mm long, 1525 mm wide, and up to 30 mm thick . Humidity should not exceed 10% . Plates are used for making doors, fences, floors , furniture , roofs.

Construction plywood consists of a flat board made of three , five or more layers *of* plywood glued together . Shp o n birch, black pine , pine and others . The oil is cut from the wood , which has been softened by pre- steaming , in the form of a continuous wide ribbon, using equipment that is welded, sheared and then cut into boards . Splint boards are made by gluing two boards perpendicular to each other . As a result, the mechanical strength of plywood increases significantly compared to that of ordinary wood . Plywood boards can be up to 3 m long, up to 2 m wide and up to 15 mm thick. Depending on the type of glue used and its water resistance , plywood is divided into high, medium and limited water resistance. A portable formwork is made from plywood with high water resistance as retaining and blocking devices for buildings , including buildings used in extremely humid conditions , as well as for concrete works . Plywood with moderate and limited water resistance is used to cover interior walls and fences . Decorative plywood is widely used for finishing interior walls , facades , panels , door panels and interior furniture . It consists of ordinary plywood glued together with textured paper or alone, covered with a layer of resin .

Most doors and windows are covered with carpentry . The carpentry materials (blocks with steel beams and trays installed) are brought to the construction as a complete set, coated and painted once . They should be stored in dry rooms without mechanical damage and moisture .

Construction of wooden devices and details. Construction wooden devices and details are made in wood processing plants and factories and delivered ready for construction , so there should be no room for their adjustment at the place of work . These include kits for prefabricated wooden houses (wooden houses, chipboard, chipboard houses) ,

10 - Mapruza	Nonotechnologies .

(map-2 hours)

1.1. Mapruza carrying technology

Washing time: 2 hours	Number of students: 50
Training form	Informative mapruza
Mapruza plan	
The purpose of the training course is to familiarize students with information about **modern materials .**	
pedagogical tasks:	*Results of training activities:*
Basic classifications Provides information on the discovery of non-technologies .	In Mapruza, they will learn about the main classifications (coverings for the floor surface,

	new technologies of laying the floor, bases for the floor). .
Nonotechnologies .	Nonotechnologies
Cleaning tools	Lecture text, blackboard, computer, projector, slides.
Cleaning methods	Informative mapping, blitz-soprov, brainstorming,
Whitening forms	Work in a team.
Bleaching conditions	An audience that can be covered by technical means and a method of working in groups.
Monitoring and evaluation	Oral questions.

Modern polbop materials **technological map of the topic of giving an understanding of.**

Work steps	The content of the teacher's activity	The content of the listener's activity
Stage 1 Introduction to the topic (10 min)	1.1. Explains the topic, plan and results of training activities. 1.2. Asks questions to enliven the topic. (Appendix 1).	They listen. They answer questions. They listen.
Stage 2. My main focus (60 min)	2.1. Mapruza turns white (Appendix 2). 2.2. Asks questions to strengthen Mapruza. (Appendix 3)	They listen and write. They listen and answer.
Stage 3. Finisher (10 min)	3.1. Makes final conclusions about the training. 3.2. He asks questions to prepare for the next topic. (Appendix 4).	They ask questions. They listen and write. They write.

FUNDAMENTALS OF NANO TECHNOLOGIES

Currently, the rapidly developing field of human activity **is nanoscience** . What is nano? The word "nano" is derived from the nanometer, a unit of length, and a nanometer (nm) is 10^{-9} of a meter , or 1000 times smaller than a micrometer, and corresponds to the size of one atom. At these dimensions, the laws of classical physics do not work, nanostructures obey only quantum laws and have properties different from those of the macroworld. This is where the name **nano science** comes from.

Nanomaterials are materials whose size is less than 100 nm and whose operational properties depend on their structural elements. In this case, the structural element affects the physical and chemical properties of the material. Therefore, nanostructures are such structures that the further reduction of their size begins to affect the properties. For example, when we make sand into a nanostructure, its heat storage and electrical protection properties increase several times, etc.

nano technologies, it is possible to create new building materials with high properties. It is necessary to create a special construction equipment based on a fundamentally new approach based on quantum mechanics to obtain materials using nanotechnology.

The socio-economic development of the 21st century is determined by the development of nanotechnologies, the emergence of new high-strength and, at the same time, light nanomaterials. Scientists predict that "nanotechnology will enter all spheres of human activity and significantly change the world."

"Perhaps in about twenty years, the world will change beyond recognition, and a golden age will await us in it" - this is the opinion of scientists - nanotechnologists who have managed to

influence the atoms and molecules of objects. Currently, nanotechnology is widely used in military affairs, electronics, biology, medicine, energy, environmental protection, and materials science. However, the promising field of using nanotechnology includes the production of new generation building materials. At present, nanotechnology is used to produce cement, ceramics, metal alloys, plastics, varnishes and other materials with excellent properties.

20-50 billion annually in the world for the implementation of nano technologies. Investments in the amount of US dollars are being spent. According to the prediction of the US National Research Foundation, by 2015 the annual turnover of the nanoindustry market will reach 1 trillion dollars.

Currently, the USA, Japan, China, Germany, and France occupy the first five places in terms of the speed of scientific and research activities of scientists. In 2000, 600 companies dealing with nanotechnology were opened in China. Microscopic nanorobots have already been created, and these microrobots are doing what they want from the atoms according to the specified program. Learning how to recreate the desired material - from wheat bread to the molecular structure of cars - is the main goal of scientists in the field of nanotechnology, and this is the highest achievement of nanotechnological developments. These developments may appear after 40-50 years.

The possibilities of nanotechnology are not limited, because it works not with the substance itself, but with the particles that make up the substance - atoms. Nanotechnology can completely change the economy, human environment and medicine. Therefore, let's consider what nanoscience and nanotechnology are and how they are applied in the building materials industry.

Nobel laureate Richard Feynman was the first to pay attention to nanoparticles. In his new pre-1960 lecture, this scientist said the following famous phrase: "There's a lot of room down there." "low" means micro level in the language of physicists.

The term "nanotechnology" was first used by the Japanese scientist Norio Taniguchi in 1974 to describe the process of manipulating individual atoms to create new objects and materials. Nanotechnology is currently developing mainly in three directions. The first step is to prepare electronic circuits at molecular or atomic scales. The second approach is in the preparation of mechanisms of such dimensions. The third closure is the assembly of objects from molecules and atoms. Now some companies can assemble some constructions from atoms and molecules (Fig. 79).

Nanotechnology in construction is a new level of scientific achievements. Let's see how nanotechnology is used in the building materials industry. The construction industry, including the building materials industry, can greatly benefit from the application of nanotechnology in manufacturing automation and robotics.

Nanotechnology allows to create new building materials with high uniformity of properties. Obtaining a new material using nanotechnology requires a new approach to the creation of special construction equipment based on the laws of quantum mechanics.

The combined use of several nanotechnologies is considered promising. For example, the technologies of activated water, highly dispersed starting materials and nanodispersed reinforcements are used together. Two nano-technologies: finer grinding of cement in rotor-pulse machines, which allows obtaining cement with a specific surface of 500 m 2 /kg and higher (the first nano-technology) and increasing the strength of cement with activated mixing water (the second nano-technology) by changing its ^{structure} - how many levels can it increase.

In the next 5-10 years, it is predicted that there will be a greater demand for nano technologies aimed at obtaining mineral binders, primarily Portland cement.

Another promising direction is the use of carbon nanostructures (nanotubes and fullerenes) to obtain woven building composites with the desired structure. Nanotubes and fullerenes are considered to be a source of oriented crystallization, resulting in a change in the crystal structure of the binder.

Nanotechnological methods are also used in the production of cement clinker, in which, in order to reduce the temperature of the solution, the temperature regime is controlled and

mineralization-catalysts are used. As a result, for example, when flocculate spar is added, the solution is formed at a lower temperature, and the viscosity zone of the rotary evaporator is pushed towards the cold zones of the evaporator, the zone becomes longer, and the crystallization of the liquid phase takes place at a lower temperature.

On the basis of field quantum mechanics, VV Ponamarchuk created the "pluton-5" device. This apparatus allows to obtain nanoparticles of cement, plaster, lime from mineral binders. As a result of energetic impact on grains of mineral binders (cement, gypsum, lime) of a certain intensity, their atoms move from a natural priority state to a passive active state. This process takes place with the formation of active particles (nanoparticles) with high reactive properties. In laboratory conditions, the effect of using cement nanoparticles as a reinforcing agent for concretes and mixtures has been determined. When these nanoparticles are added to 1 m^3 of concrete at 3-4% of cement consumption, it increases concrete strength by 1.5-2 times or reduces cement consumption by 150 kg/m^3 and more. When the consumption of cement was up to 450 kg/m^3, concrete with a strength of 100 Mpa and higher was produced. G25 grade high-strength gypsum was obtained on the basis of G6 grade gypsum nanoparticles, and 300 grade quartz cement was obtained on the basis of quartz sand nanoparticles.

The introduction of nanotechnology in the building materials industry has shown that the nanotechnology of concrete and its structure should be based on the science of surfaces, in particular on the methods related to the activation and sensing of particle surfaces. It is not necessary to reach the nano level, because it is practically impossible to get the particles down to the nano level. But the feeling of the bag always leads to the activation of the surface.

Application of 20% blast furnace slag with mineral filler allows to obtain concrete of class V90 and higher in 28 days, concrete of class V90 exceeds V100 after 56 days. These results were obtained using the pTS400-D20 cement using the "powder-clay" method. The use of powder as an admixture in concrete is based on the creation of an additional structural element of the powder structure in the concrete mixture. As a result of the reaction of the silicon oxide nanoparticle with $Sa(ON)_2$ over time, this element turns into calcium hydrosilicate and causes a decrease in the number of pores with a size of 1 nm and above. That is why voids in the concrete structure are found with powder and new structures formed as a result of its reaction. In this case, the strength and plasticity of concrete increases

IV - PRACTICAL TRAINING MATERIALS

Grade-lash type	T the contents of the soup	Maxi - mall ball	Due date	Receiv ed – score	2nd term dat (-1) points	Result ant score
1-JN	Practical training	10				
	1st practical exercise Solving problems to determine the main property of the material	4				
	2nd practical training Plastic fittings made of mineral and silicate fiber Molding of reinforced concrete structures in long stents	4				
	3rd practical training Chemical additives for concrete and mixtures Modern dry construction mixtures	4				
	4 - practical training Modern materials	4				

	Total	16				
	Student participation in training. activity, to creative thinking. To make a decision, to be able to draw a conclusion	4				
	Total 1JN	20 p				
2-JN	Practical training	10				
	5 practical exercises. Modern materials for curtains Modern tompop material	4				
	6 practical exercises. Modern polbop materia	4				
	7 practical exercises. Modern thermal insulation materials Modern decorative coatings	4				
	8 practical exercises. Local industry production of materials based on the waste of enterprises Experiences in the use of non-technological elements in building materials	4				
	Total	16				
	Student participation in training. Activity creative thinking. To make a decision conclusion to be able to take out	4				
	Total 2JN	20 p				
	Total: 1, 2 JN+	40b				

W. BANK OF CASES

T O PSHIRICS

Enter. "The purpose and task of the science of construction materials" educational lessons on the subject

Guruh bilan ishlash qoidalari

Guruh ahzolarining har biri

- o’z sheriklarining fikrlarini hurmat qilishlari lozim;
- berilgan topshiriqlar bo’yicha faol, hamkorlikda va mashuliyat bilan ishlashlari lozim;
- o’zlariga yordam kerak bo’lganda so’rashlari mumkin;
- yordam so’raganlarga ko’mak berishlari lozim;
- guruhni baholash jarayonida ishtirok etishlari lozim;
- “Biz bir kemadamiz, birga cho’kamiz yoki birga qutilamiz” qoidasini yaxshi bilishlari lozim.

Form an answer to the question in one sentence .

1. What types of modern building materials and constructions do you know ?
2. What is the content of the State Standards for modern building materials and constructions?
3. *Explain the meaning of these concepts .*

4. Content of concepts of secondary resources, industrial waste .

The use of various secondary resources in the production of construction materials and products leads to a decrease in the cost of products.

On the topic of physical and mechanical properties of construction materials and products

Educational assignments

Guruh bilan ishlash qoidalari

Guruh a'zolarining har biri

- o'z sheriklarining fikrlarini hurmat qilishlari lozim;
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- "Biz bir kemadamiz, birga cho'kamiz yoki birga qutilamiz" qoidasini yaxshi bilishlari lozim.

1. **Form an answer to the question in one sentence.**

What physical properties of modern construction materials do you know ?

2 What is the content of the strength of modern construction materials?

3 *Explain the meaning of these concepts.*

The average density of building materials is always less than the actual density.

Most modern building materials are porous, so their average density is always less than their actual density. Only dense materials (steel, glass, bitumen and some other materials) have the actual and average density practically equal, because they have very small internal pore sizes.

1. There is situation

Tensile strength. The strength of the material is determined by the strength limit (in compression, bending and stretching). The strength limit is the stress equal to the force that can break the material sample. The *ultimate strength (MPa)* in compression R_{siq} or in tension R is calculated by the following expression:

$$R_{сиқ}(R_{чуз}) = P/F,$$

where R is the destructive force, N ; F is the cross-sectional area of the sample, mm ^{2}

Bending strength limit R_{eg}: when the load is concentrated in one place and when the cross-section of the sample - the beam is right-angled :

$$R_{эг} = 3Pl/2bh^2$$

in two equal forces located m o nand relative to the axis of the hammer

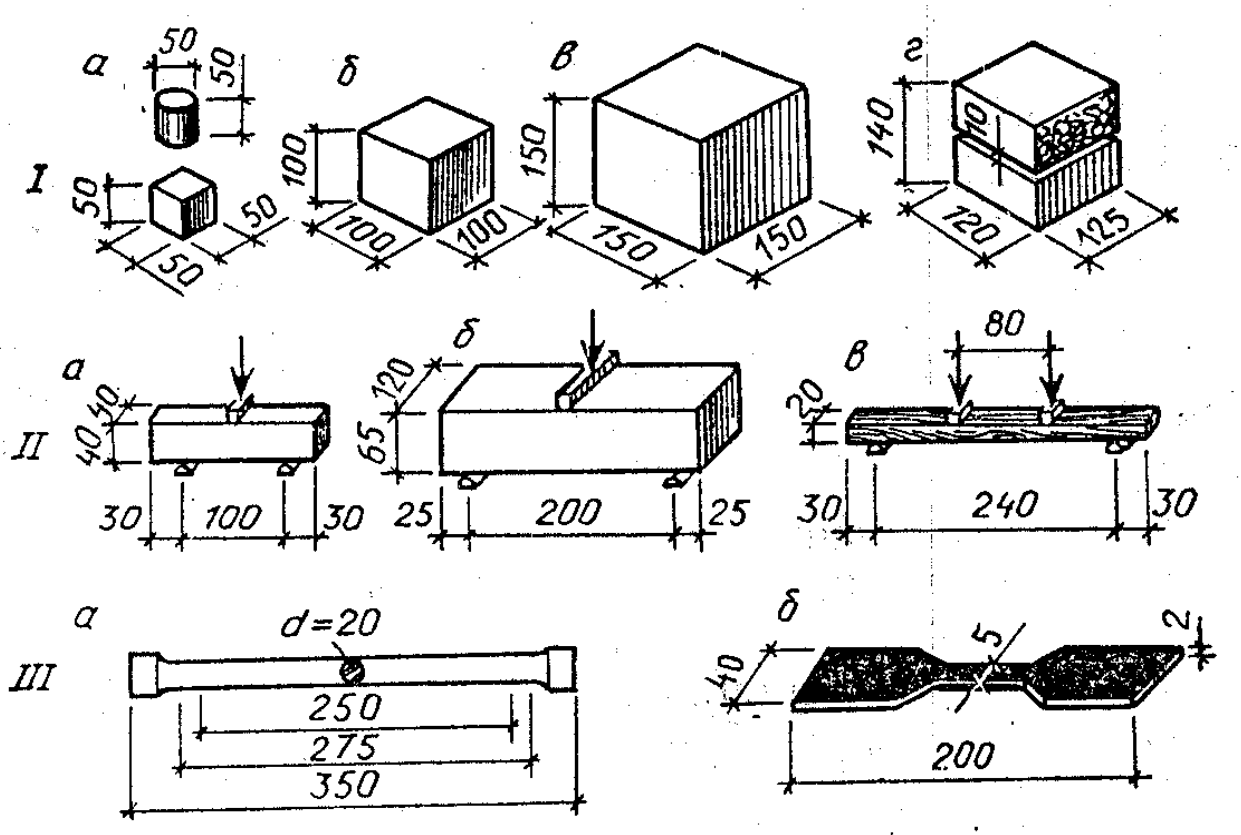
$$R_{эг} = P(l-a)/b\,h^2$$

this where : R is decaying power , H ; l - distance between supports (prolyot) mm;

a- distance between loads, mm;

b- b and h – width and height of the cross section of the hammer, mm.

Q: What samples are used to determine the strength of materials?



1. What type of durability can be determined using the samples in the picture?

I - _____; II - _____ ; III -_____

.

2. What material are the samples made of?

I : a -_____; b-_____; v -_____; г - _____.

II: a-_____; b -_____; v -_____.

III: a-_____; b -_____.

2 – Situational task

The hardness of a material is the property of resisting the penetration of a material much harder than it. This property is of great importance for materials used

in road construction. In addition, the hardness of the material is characterized by the laboriousness of processing it.

There are several ways to determine material hardness. Wood-board, concrete hardness is determined by pressing a pestle on the samples. The degree of hardness is determined by the penetration depth of the ball or by the resulting diameter. The hardness of natural stone materials is determined by the hardness scale (Maos method). In the scale, specially selected minerals are placed in such a sequence that the next mineral in the order leaves a line (nail mark) on the previous mineral, but does not itself. For example, if the tested material is scratched with a stick, it leaves a mark on the surface, then its hardness is equal to 4.5.

Question: Complete the Maos hardness scale according to the hardness of the mineral (Table 1).

1 . Maos scale of mineral hardness

Hardness k indicator	Minerals	Definition of hardness of minerals
1		It is easily scratched with a nail
2		There is a mark from the nail
3		The 'plague' is easily traced
4		It is necessary to draw a little harder to leave a trace of the plague
5		A mark will remain only when the pestle is pressed hard with the tongue no residue on the bottle
6		A slight trace of the glass remains; There is no trace left when drawin with the 'olat 'ichak
7		It is easy to make a mark with a glass, it will not leave a mark from th plague
8		That's why
9		That's why
10		That's why

3 – Situational assignment

Precious ceramic materials and products

The range of wall ceramic materials includes ceramic bricks **,** various effective ceramic materials, as well as wall brick anels. Currently, the most common is ceramic brick

Ceramic brick size 250x120x65 mm or 250x120x88 mm

The density is 1600-1900 kg/m ^{3} , and the thermal conductivity is 0.71-0.82 W/(m $\cdot^{0}$ C). Water absorption is at least 8%.

According to compressive and bending strength, bricks are divided into brands: 75,100,125,150,175,200 and 300

Compressive strength limit R_{siq} ,M'a:

R_{siq} = '/S

where '-absorbing force, H;

S - area under stress (sample cross-section), mm ^{2} **.**

5 bricks are taken to determine the strength limit in the collapse of ceramic brick ? Each of them is sawn in the middle and glued together with a cement mixture. Prepared samples are tested using a hydraulic 'ress

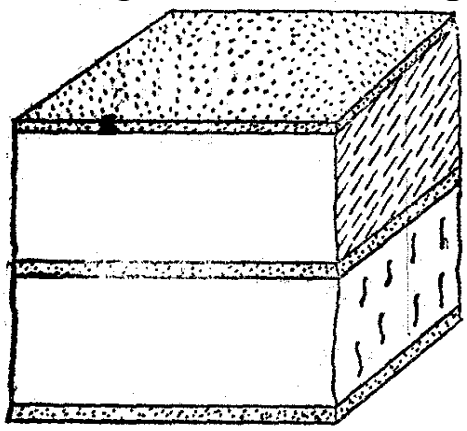


Figure 2. A cube-shaped specimen to be tested to determine the compressive strength of a brick

Question: Explain the formula for the compressive strength limit of a brick R_{siq} , MPa:

4 – Situational task

List (board) window

The glass industry of our republic produces several types of flat glass, in particular, ordinary window glass, showcase glass, reinforced, patterned, heat-absorbing and other glass.

Unpolished colorless wooden *window glass* is widely used in construction. This glass is produced in the form of boards with a thickness of 2-6 mm and sizes from 400x400 to 1600x2200 mm, they transmit 85-90% of light. Window glass is installed on wooden, metal and plastic frames installed in light-reducing spaces of residential and industrial buildings.

Question: give the dimensions of the wooden window pane

4 – Situational task

Mineral binders (lime)

Air-dry construction lime is a binding agent obtained by moderate crushing of limestone, containing 6% clay admixture with coal ash **.** $\mathbf{CaCO_{3=}CaO+CO_2}$

Lime fading. When mixing slaked lime with water, calcium oxide turns into calcium hydrate in the following expression: $CaO+H_2O = Ca(OH)_2$. This process is called "lime quenching" and at the same time a large amount of heat is released and intense steam is produced. If mortar is used without quenching (for example, in plastering), it releases heat during the quenching process and increases in volume, which causes cracks in the plaster.

Question: Why is lime slaking necessary?

5 – Situational assignment
Plaster

Gypsum retention periods Gypsum is divided into three groups according to retention periods:

- A - quick seizure (seizure starts 2 minutes and ends 15 minutes);
- B-normal seizure (from 6 minutes to 30 minutes);
- V-slow setting (20 minutes from the time the plaster is applied)

When gypsum sets quickly, it becomes difficult to work, so if necessary, setting retarders (animal glue, sulfate yeast braga - SDB, etc.) are added in the amount of 0.1-0.3% according to the mass of plaster. In the production of gypsum-concrete products, it becomes necessary to accelerate the setting of gypsum, in this case, natural bimolecular water gypsum and a little table salt are added to it.

Question: What substances are added to slow down the rapid setting of gypsum?

6 – Situational assignment
Portland cement.

Portland cement refers to a hydraulic binder whose composition is mainly (70-80%) calcium silicate. It is finely ground Portland cement clinker with gypsum, in some cases with special additives.

raw material for the production of portland cement. For the production of portland cement, rocks - marls, limestone (limestone, chalk, shale, limestone tuff, etc.) and clayey rocks serve as primary raw materials. CaO is added to the cement along with limestone; clay with silicon (SiO_2), aluminum (Al_2O_3), iron oxides (Fe_2O_3); all other oxides are introduced with marl. A typical raw material mix consists of 75-78% limestone and 25-22% clay.

Production of Portland cement

according to the sequence of production of portland cement:

A) Mining of raw materials,

B) Preparation of raw materials

C) Incineration of raw materials
G) Saturation of clinker with gypsum (1.5-3.5%) and additives in necessary cases

In the production of Portland cement in a dry method, the process of laying the mixture of cement can be divided into 6 zones:

1. Drying zone - the temperature rises to 200 ^{0}C.
2. Heating zone (dehydrogenation) - temperature is 200-700 ^{0}C.
3. D ekorbanizatsi ya zone - the temperature rises to 700-110 0 ^{0}C.
4. The zone of exothermic reactions - the temperature ranges from 110 0 to 1300 ^{0}C.
5. Annealing zone - the temperature increases from 1300 to 1450°C and decreases again to -1300 ^{0C} . Minerals formed in this zone are partially dissolved, reuniting to form $3CaO \cdot SiO_2$. At a temperature of 1450°C, $2CaO \cdot SiO_2$ and CaO combine to form alite, and 0.5-1% of free CaO remains in the clinker. As the dissolved minerals continuously roll on the walls of the steam room, bubbles are formed. In this zone, the temperature increase to 1300°C leads to the crystallization of the solution and $3CaO \cdot Al_2O_3$, $4CaO \cdot Al_2O_3 \cdot Fe_2O_3$ and lead to the formation of MgOs.
6. Clinker in the cooling zone temperature increases from 1300 to 1000 ^{0}C and clinker minerals C_3S, $C_2SC_3AC_4AF$- and MgO are formed.

Question: What clinker minerals are formed in the calcination zone ?

7 – Situational assignment
Concretes

Concrete **is** an artificial stone material obtained as a result of solidification of rationally selected, carefully mixed and compacted mineral binding agent, water, fillers and, if necessary, special additives.

- As fillers for concrete, gravel (smooth surface) and crushed stone (surface jagged). For high-strength concrete, only crushed stone is used.

Question: why is only crushed stone used for high strength concrete, even though it is more expensive than gravel **?**

5- Conditional assignment

Identify energy-saving measures in precast concrete production enterprises

Tr	TSex or department	energy resources	Measures to save energ resources
1	**Concrete mixing department**	Portland cement unloading, storage. When choosing a concrete composition. In the use of quality fillers .	
2	Fitting shop	Malfunction of fittings manufacturing equipment. Fittings waste.	
3	Molding workshop	The technological process is not properly organized . Q oliping equipment failure.	
4	Heat treatment department	Disadvantages of heat treatment . Cameras are not tightly closed, this is heating.	

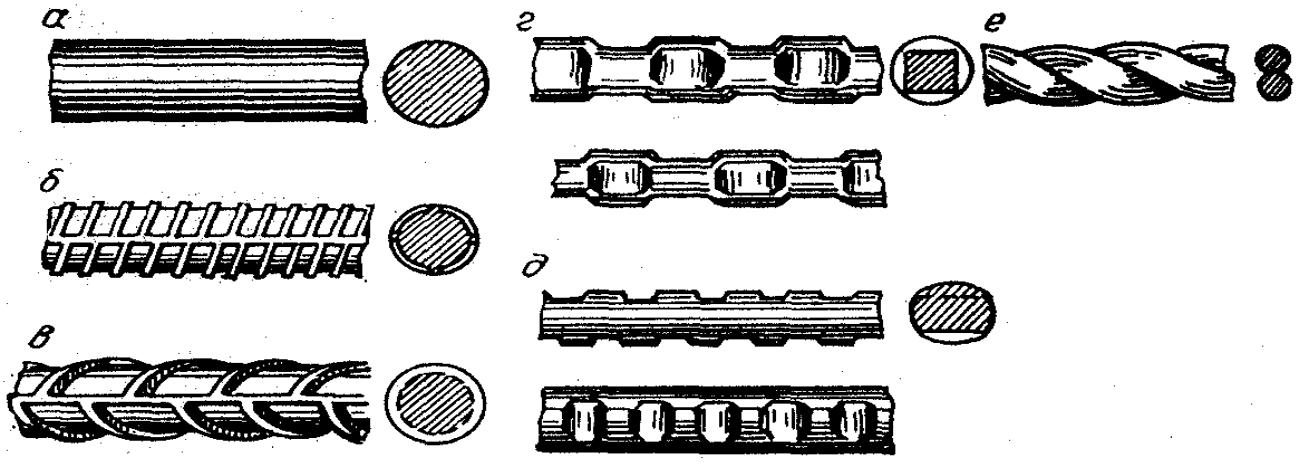
6- Conditional assignment

Steel reinforcement is the most important component of reinforced concrete and it should not lose its strength during long-term operation of the product or equipment together with concrete. Reinforcement is mainly installed in the parts of the product and device that are affected by tensile forces, and it must withstand these forces.

The method of preparation of reinforcing steel is divided into types according to the profile of the rods and the field of use. Reinforcing steel is hot-rolled, and steel and cold-rolled wire are made. Depending on the profile of the rods (depending on the surface), the rod and wire fittings will be smooth and profiled. Depending on the conditions of use, reinforcing steel is divided into tensioning and non-tensioning, i.e. simple and pre-stressed reinforced concrete devices.

Q : What types of steel fittings do you know?

Regarding the topic of types of steel reinforcement



Reinforcement steel types

a -_____ ; *b* -_____;

v -_____;

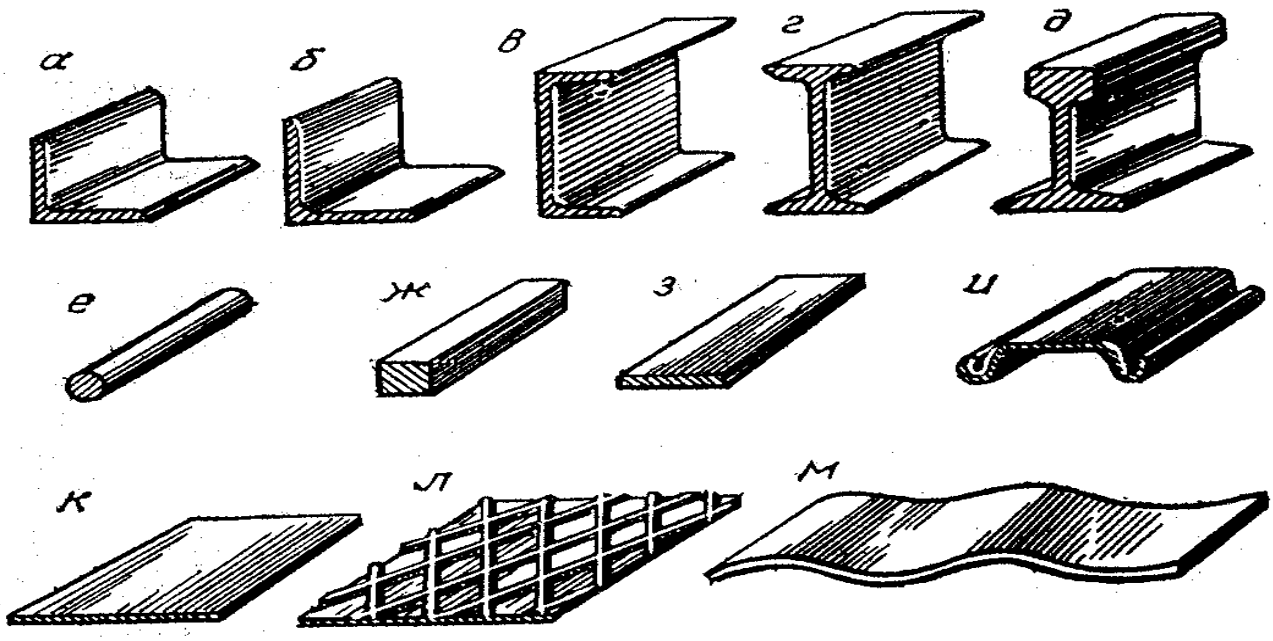
g- _____;

d -_____;

e-_____.

2. Rolled angle steel is produced in the form of equal-sided and non-equal-sided corners with a width of 20-250 mm; the height of the channel is 50-400 mm and the width of the shelves is 32-115 mm; both simple and wide-shelf cabinets are produced. The height of the standard cabinets is 100-700 mm, and the width of the shelf is up to 1000 mm. The ratio of the width to the height of the shelves varies from 1:2 (when the height is small) to 1:3 (when the height is large).

Question: What is the range of rolled steels ?



of rolled steels

a- _____ ; b- _____ ; v- _____ ; g- _____ ;

d- _____ ; eat _____ ; j- _____ ; z- _____ ;

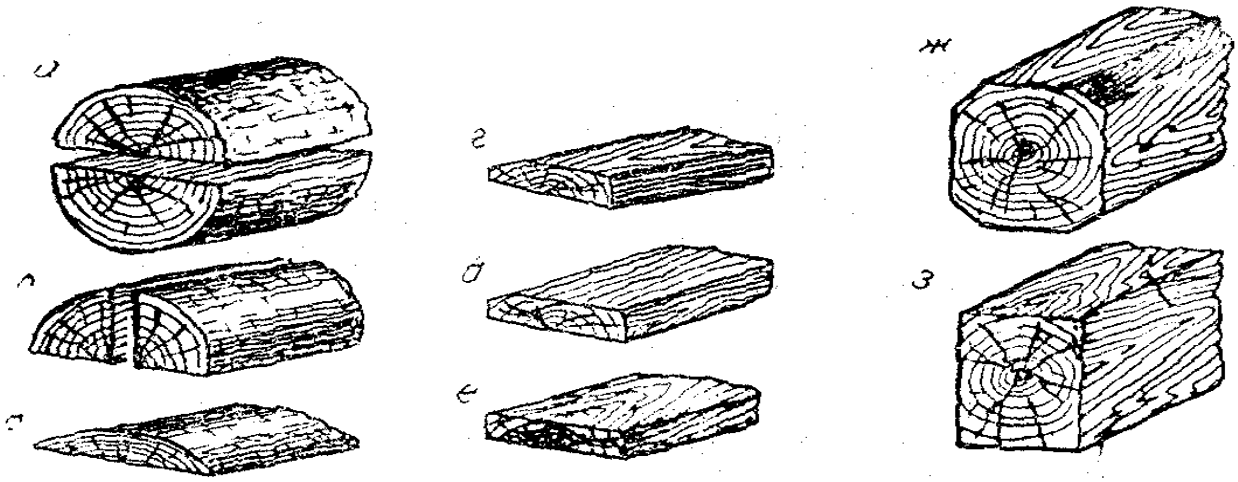
i- _____ ; k- _____ ; l-_____; m-_____.

6 – Situational assignment

Assignments related to wood materials

Sawn timber materials are prepared by sawing the sawn timber lengthwise. Depending on the shape of the cross-section, sawn materials can be divided into the following types: plates, plywood, pushboards , boards, brushes, brushes.

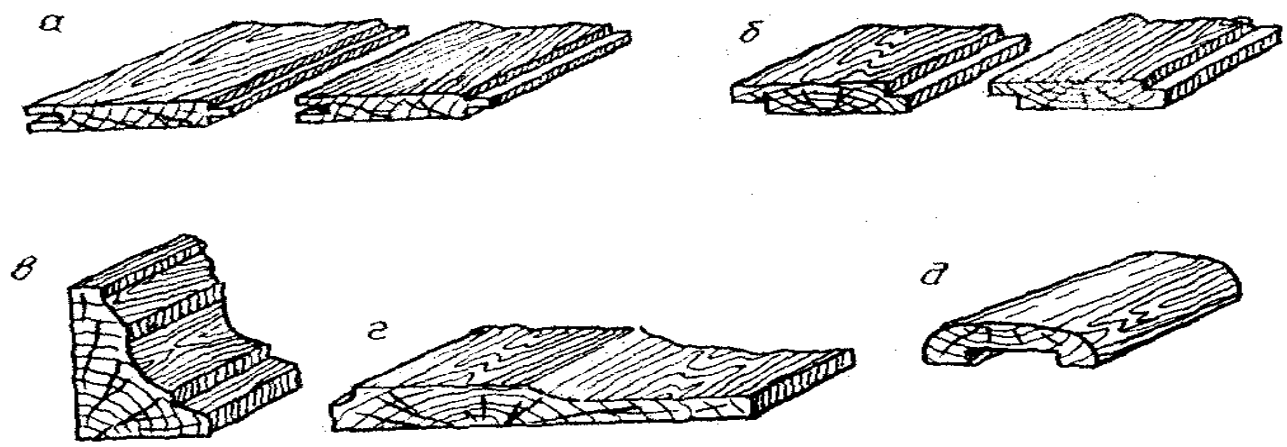
Question: Give the name of sawn materials.



Name the sawn materials.

a-_____; b-_____; g-_____; d- _____; g- _____; j-_____; z-_____.

Question: Give the names of the pogonage items.



Give the names of the pogonage items.

a-_____; b-_____; v-_____; g- _____; d-_____

ISSUE .

Масала

1. Qум стандарт элаклар то’пламида эланганида qуйидаги арим qолдиqлар hосил бо’лди: № 2,5-124 г; № 1,25-136 г; № 0,53-199 г; № 0,315-500 г; № 0,16-31 г. Qумнинг зичлиги – 2630 кг/м^3, то’кма зичлиги – 1550 кг/м^3. Qумнинг зарралари орасидаги бо’шлиq, то’ла qолдиqлар, майда-йириклик модули аниqлансин ва qумга таъриф беринг.

- ***Масала***

- Айрим qолдиqлар ко’ринишида чаqиqтош qуйидаги таркибга эга № 40-3 %; № 10-52 %; № 5-17 %; № 3-5 %. Йирик то’лдиргичнинг энг йирик ва энг кичик йириклигини аниqланг.

• ***Масала***

- Чаqиqтошнинг то’кма зичлиги – 1450 кг/м^3; хаqиqий зичлиги эса 2500 кг/м^3. То’лдиргичнинг бо’шлиg’ини аниqланг.

• ***Масала***

Маркаси 200 бо’лган оg’ир бетонни тайёрлаш учун маркаси 400 бо’лган портландцемент ва о’ртача сифатли то’лдиргичлардан фойдаланилди. Ана шу бетон учун С/Ц нисбати нечага тенглиги аниqлансин.

• ***Масала***

Оg’ир цементли бетоннинг номинал таркиби qуйидаги нисбатда лойиhаланди: 1:2:4. ва С/Ц =0,45. 1 м3 бетон учун 315 кг цемент сарф бо’лса 250 м3 бетон тайёрлаш учун сарф бо’ладиган материаллар миqдори аниqлансин. Qумнинг намлиги 3%, чаqиqтошники эса 2%.

• ***Масала***

Зичлиги $\rho_{б.см}$ = 2300 кг/м^3 ва С/Ц=0.42 бетон qоришмасини Ц:Q:Ч=1:2:4 нисбатдаги таркиби аниqлансин.

Масала

Хажми 500 литр бо’лган бетонqоргичда бир марта тайёрлаш учун qумсиз бетон qоришмаси таркиби аниqлансин. Бетоннинг ичши таркиби (масса бо’йича) Ц/Ч=1:1,25. 1 м^3 бетон qоришмаси учун 150 кг цемент зарур. Цемент ва чаqиqтошнинг то’кма зичлиги 1250 кг/м^3 ва 1520 кг/м^3 га тенг.

Масала

Таркиби 1:8 (хажм бо’йича), С/Ц-0,65 бо’лган 1 $м^3$ абсолют зич цемент-қумли бетон учун материаллар сарфини аниқланг. Қумнинг бо’шлиғ’и 42%, цемент эса 3100 кг/$м^3$ зичликка ва 1300 кг/$м^3$ то’кма зичликка эга.

Масала

1 м3 оғ’ир бетоннинг лаборатория таркиби қуйидагича бо’лса:
цемент – Ц=312 кг
сув – В=178 л
чақиқтош – Щ-1283 кг
қум – П=600 кг. Унинг ишчи таркиби хисоблансин.
Қум ва чақиқтошнинг намлиги 4 % и 2 %.

Масала

200 ва 300 маркали 1 м3 бетон учун цемент сарфи аниқлансин. Цементнинг активлиги – 400 кг/$см^2$, бетон қоришмасининг сув талабчанлиги 196 л/$м^3$. Мустаҳкамлик формуласи бо’йича А=0,6.

Масала

1 $м^3$ бетон учун цемент сарфи 250 кг ва сувники – 200 л бо’ганида бетоннинг мустаҳкамлиги 14 МПа га тенг бо’лди. Мустаҳкамлик формуласидан фойдаланиб ва сув талабчанликнинг доимийлиги қоидасидан фойдаланиб, тенг харакатланувчи қоришмалар учун 1 м3 бетон учун цемент сарфи 350 ва 400 кг гача оширилса бетон мустаҳкамлиги нечага тенг бо’лиши аниқлансин.

Масала

Нам-иссиқ ишлови берилганидаги мустаҳкамлиги 40 МПа ва корхонадан бериладиган мустаҳкамлиги 28 МПа бо'лган бетоннинг 28 кунлик даврдаги мустаҳкамлиги аниқлансин ва таркиби хисоблансин.

Масала

Нам шароитда ишловчи, нам иссиқ ишлови берилганидан кейинги мустаҳкамлиги 30 МПа бо'лган олдиндан зо'риқтирилган ригель учун бетон таркибини хисоблаб топилсин.

Масала

Бетон қоришмасининг ишчи таркиби масса бо'йича қуйидаги нисбатга эга бо'лганида Ц:П:Щ=1:2:4, С/Ц нисбати 0,42 ва о'ртача зичлиги 2300 кг/м^3 бо'лган бетон учун материаллар сарфи аниқлансин.

Масала

Қуруқ шароитда ишловчи, иссиқ нам ишлови берилганидан кейинги мустаҳкамлиги 30 МПа бо'лган олдиндан зо'риқтирилган конструкция учун бетон таркиби хисоблансин.

Масала

Ко’прикларнинг олдиндан зо’риқтирилган балкаларни тайёрлаш учун иссиқ нам ишлови берилганидан кейинги мустаҳкамлиги 32 МПа бо’лган олдиндан зо’риқтирилган конструкция учун бетон таркиби хисоблансин.

Масала

28 суткалик мустаҳкамлиги 40МПа бо’лган бетон қоришмасини С-3 қо’шимчасидан фойдаланиб тайёрланадиган таркиби хисоблансин.

The procedure for determining the composition of heavy concrete

Problem . For concreting of cast-in-place beams and columns of medium cross-section, it is required to select the composition of heavy concrete M300 brand with R_b =30 MPa and to calculate the material used for the mixture in a concrete mixer with a useful volume of the drum *V 1200 l.*=

The compressibility of the concrete mixture S_1 =2. . . 4 cm.

Details of initial materials: portland cement with activity R_{ts} =44 MPa, bulk density of dry constituents $p_{t.ts}$ =1200 kg /m ^{3} ; r_{tq} =1500 kg /m ^{3} ; $r_{t.ch(sh)}$ =1600 kg /m ^{3} ; their real density r_{ts} =3100 kg /m ^{3} ; r_q =2600 kg /m ^{3} ; r_{ch} =2700 kg /m ^{3} ; porosity of fractionated granitic stone is 0.41; the large grain size of small stone is 40 mm, the size of large quartz sand is W_q =4%, the moisture content of small stone is W_{ch} =1.

We calculate the water-cement ratio from the following expression.

$$R_b = AR_{ts}(TS/S - 0.5)$$

This expression will look like this after changes:

$$C/TS = AR_{ts}/(R_b + 0.5A) = (0.65 + 44)/(300 + 0.5 \cdot 0.65 \cdot 4) = 0.65$$

A =coefficient of 0.65 as high-quality materials select from the table.

the water consumption S for 1 m $^{3\ of}$ concrete mixture from the table, taking into account the given slump h of the concrete mixture cone for concreting blocks and columns S_1 =2.....4 cm. As a coarse aggregate, a 40 mm fine stone is used to produce a concrete mix , S =175 kg.

The amount of cement used for 1 m ^{3} of concrete:

$$TS = S / (S / TS) = 175 / 0.65 = 269 \text{ kg}$$

constitutes

We determine the amount of fine stone in the dry state used for 1 m ^{3} of concrete from the following expression:

$$Ч = \frac{1}{V_{к.ч}\alpha/\rho_{т.ч} + 1/\rho_{ч}} = \frac{1}{0{,}41 \cdot 1{,}3/1600 + 1/2700} = 1422кг$$

the value of the particle thrust coefficient $\alpha = 1.3$ in accordance with the recommendations.

We determine the consumption of dry sand per 1 m ^{3} of concrete from the following expression:

$$S\,[1 - (TS / \rho_{ts} + S/1000 + TS / \rho_{ч})]\ \rho_{Q} =$$

$$= [1 - (269/3100 + 175/1000 + 1422/2700)]\,2600 = 551 \text{ kg}$$

As a result, we have the following approximate nominal (experimental) composition of concrete, kg /m ^{3} :

Cement. 269

Water. 175

Sand. 551

Pebble stone. 1422

Total. 2417

The value obtained at the end is the calculated density h of the concrete mixture, i.e. h is $\rho_{тб.к} = 2417$ kg /m ^{3} .

We find the coefficient of the amount of concrete to be obtained from the following expression:

$$\beta = \frac{1}{Ц/\rho_{т..к} + К/\rho_{т..к} + Ч/\rho_{.т..к}} = 1 : (269/1200 + 551/1500 + 1422/1600) = 0{,}68$$

Test mixture - 0.05 m ^{3} (50 l) of concrete, we calculate the consumption of material based on the nominal concrete content given above , kg :

Cement. . . . . 269 ·0.05 =13.45

Water. . . . . .175 ·0.05 =8.75

Sand. . . . . 551 ·0.05 =27.55

Pebble stone, kg. . . . . 1422 ·0.05 =71.1

All materials are weighed in the amount specified in the calculation and a concrete mixture is prepared from them, the compressibility of which is

determined using a standard cone. If the cone sinks by 1 cm, that is, less than specified, then 10% cement and water are added to increase the flowability of the concrete mixture (13.45 ·0.1 =1.345 kg of cement, 8.75 ·0.1 =0.875 kg of water) .

In addition, the concrete mixture with cement and water is mixed thoroughly and the flowability is checked. If the subsidence of the cone is equal to 3 cm (which is in accordance with the specified limit), then it is recalculated to determine the actual consumption of materials, taking into account the addition of 10% water and cement . In this case, their relative volume is determined, m ^{3} :

Cement. . . . . (13.45 +1.345) /3100 =0.0048

Water. . . . . (8.75 +0.875) /1000 =0.0096

Sand. . . . . .27.55 /2600 =0.0106

Pebble stone. . . . . 71.1 /2700 =0.0263

X is 0.0513

Knowing the volume of the adjusted test mix-concrete mixture V_q and the actual consumption of the material TS q , $_S q$, Q_q , CH , we can calculate the material consumed per 1 m $^{3 \text{ of the concrete mixture}}$ h according to the following expression, kg:

$$TS = TS_q \cdot 1 / V_q = 14.80 \cdot 1 / 0.0513 = 288$$

$$S = S_q \cdot 1 / V_q = 9.63 \cdot 1 / 0.0513 = 188$$

$$Q = Q_q \cdot 1 / V_q = 27.55 \cdot 1 / 0.0513 = 537$$

$$CH = CH_q \cdot 1 / V_q = 71.7 \cdot 1 / 0.0513 = 1398$$

H is an aunt. 2411

The density of the newly laid concrete mixture $\rho_{is} = 2411$ kg /m ^{3} , i.e. it differs by 1% from the calculation .

the composition of concrete in the factory (field) taking into account the moisture content of the fillers (in this example, the moisture content of sand is 4% and the moisture content of small stones is 1%) - we reduce the amount of water needed.

$$188 - (4 \cdot 537 / 100 + 1 \cdot 1398 / 100) = 188 - (21 + 14) = 153,$$

We increase the amount of fillers accordingly:

Sand, kg $-537(1 + 4 / 100) = 537 + 21 = 558$;

Sandstone, kg $-1398 (1 + 1 / 100) = 1398 + 14 = 1412$.

To obtain the composition used in the enterprise, we divide the consumption of each additional n i of concrete mixture by the consumption of cement in proportions by mass:

TS /TS:Q /TS:CH /TS =288 /288:558 /288:1412 /288 =1:2:5

where S /TS =is 0.54

mass of the constituents of the concrete mixture for a single mixture of a concrete mixer with a useful drum volume of 1.2 m $^{3\,(1200\,l)}$:

TS =(bV /1000) TS =(0.68 ·1200 /1000) · 288 =237;

C =(bV /1000) S =(0.68 ·1200 /1000) · 153 =125

Q =(bV /1000) Q =(0.68 ·1200 /1000) · 558 =455

SHCH =(bV /1000) CH =(0.68 ·1200 /1000) · 1412 =1152

In the experiment, we prepare 150, 150 ×, 150 control sample cubes –from the 50 l test mixture , and then test them in a ×hydraulic press after 7 and 28 days of storage under normal conditions. According to the test results, we determine the water-cement ratio that ensures the formation of concrete of the given grade.

Appendix 1

Construction for students to do independent work on the choice of concrete composition from the science of materials

OPTIONS

variant serial number	Concrete strength ,	The activity of cement ,	Concrete mix spreading K.CH.	Bulk density of	Bulk density of Qum	Density of bulk stone	Cement _ yes q i q iy	Sand yes q i q iy	Density of crushed	The killers _ s _ coefficient A	The killers _ Grain size , mm.	Q um humidity ,%,	CHa q i q stone
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	100	300	5	1.1	1.3	1.4	3.1	2.5	2.7	0.55	40	5	3
2	200	300	3-4	1.2	1.2	1.4	3.1	2.5	2.7	0.55	20	4	2

3	200	400	3-4	1.2	1.3	1.45	3.1	2.6	2.8	0.6	10	4	2
4	250	400	2-2.5	1.2	1.35	1.5	3.1	2.6	2.8	0.6	40	4	2
5	300	400	2-2.5	1.25	2.4	1.5	3.1	2.6	2.9	0.6	20	3	1
6	300	500	1	1.25	1.4	1.6	3.1	2.65	2.95	0.6	10	3	1
7	400	500	20-30	1.3	1.45	1.6	3.1	2.65	2.95	0.65	20	3	1
8	400	500	20-30	1.3	1.45	1.7	3.1	2.7	3.0	0.65	20	3	1
9	500	600	30-50	1.4	1.5	1.7	3.1	2.7	3.0	0.65	40	3	1
10	100	300	6	1.1	1.3	1.4	3.1	2.5	2.6	0.55	20	5	3
11	150	300	7	1.1	1.3	1.4	3.1	2.5	2.7	0.55	10	5	3
12	200	300	5	1.15	1.35	1.45	3.1	2.6	2.7	0.55	20	5	3
13	200	400	3-4	1.2	1.35	1.45	3.1	2.6	2.9	0.6	20	4	2
14	250	400	3-4	1.2	1.4	1.5	3.1	2.7	2.9	0.6	10	4	2
15	300	400	2-2.5	1.25	1.4	1.5	3.1	2.7	2.9	0.6	10	4	2
16	300	500	2-2.5	1.25	1.4	1.5	3.1	2.75	2.95	06	40	4	2

17	350	500	1	1.3	1.45	1.55	3.1	2.75	2.95	0.65	40	3	1
18	400	500	15-20	1.3	1.45	1.6	3.1	2.8	3.0	0.65	40	3	1
19	400	600	20-30	1.35	1.5	1.65	3.1	2.8	3.0	0.65	40	3	1
20	500	600	30-50	1.35	1.5	1.7	3.1	2.8	3.05	0.65	40	3	1

VI. FORM AND CONTENT OF INDEPENDENT EDUCATIONAL ORGANIZATION

" Modern **The independent** education of the student on "construction materials and products" is a component of the learning process of this subject and is fully provided with methodological and informational resources .

Students listen to professors' lectures , solve examples and problems , and perform experimental work during classroom sessions. Outside the auditorium, the student prepares for classes, summarizes literature, and does homework. In addition, in order to study some topics more widely, he prepares abstracts by reading additional literature and solves tests on the topic. The results of independent education are evaluated based on the rating system.

Completing tasks at home, independently learning new knowledge from additional textbooks and literature, searching for the necessary information and determining ways to fill it, using the Internet to pay for information and conduct scientific research, scientific payment such as preparation of scientific articles and lectures within the framework of the workshop or independently using scientific sources, deepens the knowledge of students, develops their independent thinking and creative abilities. That is why educational activities cannot be effective without independent education.

Homework is checked and evaluated by the teacher who conducts the practice session, and notes and subject mastery are checked and evaluated by the teacher who conducts the lecture classes in each lesson.

" Modern construction materials and products" covers all subjects of the subject and is formed in the form of the following 12 major subjects.

Independent educational topics in the science of modern building materials and constructions

1. Production of modern construction materials in Uzbekistan.
2. What do you know about wall materials ?
3. Do you know the history of production of sanitary ware made using clay?
4. What kind of clay is used to make sanitary-technical products?
5. What is clay tile ?
6. What is granite ?
7. the granite production technology.
8. What methods are used to obtain carpet-mosaic tiles ?
9. list the accessories.
10. Describe the special ceramics.
11. What do you know about the modern method of glass production?
12. Tell us about the technological process of glass production.
13. What is a BOTTLE?
14. How is a BOTTLE made?
15. What does the thermal conductivity of the glass package depend on?
16. Why is silica gel used in bottle packaging?
17. How are glass blocks made?
18. What building materials are made of glass?
19. Plastic fittings made of fiberglass.
20. Modern finishing materials.
21. What modern lubricants do you know?
22. Prospects for the use of non-metallic reinforcements in prestressed structures.
23. Modern lightweight mineral and organic fillers.
24. How is the tension of the prestressed reinforcement maintained until the concrete hardens?
25. What percentage of the design grade of the concrete grade should be at the time of applying the tension of the reinforcement to the concrete?

26. In what ways is heat wet treatment given in the preparation of prestressed reinforced concrete structures?
27. What types of reinforcement are used in continuous molding of reinforced concrete structures?
28. What are the advantages of making reinforced concrete structures in internal support forms?
29. What are dry construction mixes?
30. Describe the classification of dry construction mixes?
31. What are the components of dry building mixes?
32. What are the uses of dry construction mixes?
33. What are the main processes of dry construction mixture preparation technology?
34. Which enterprises produce dry building mixes in Uzbekistan?
35. What are the advantages of dry construction mixes?
36. The advantage of continuous molding of reinforced concrete structures
37. Basalt and polypropylene fibers. Using them in the production of building materials.
38. Classification of chemical additives for concrete and mixtures.
39. Use of fibers in the preparation of concrete and mixtures
40. Properties of composite fittings compared to metal fittings.
41. Technology of continuous molding of reinforced concrete structures.
42. State of production of modern building materials in Uzbekistan.
43. Complex additives for the production of concrete and mixtures.
44. Modern wall materials.
45. What is concrete class ?
46. Concretes are divided into classes according to which parameters?
47. What is the purpose of lightweight concrete?
48. What is the purpose of creating gpovac structure in concrete?
49. What methods do you know to create a gpovac structure in concrete?
50. What purpose is wollastanite used in concrete ?
51. Describe the technology of concrete production.
52. Modern aggregates for concrete and mixtures
53. Modern covering materials.
54. How should air exchange be controlled in residential buildings?
55. What is a ventilated facade ?
56. What are the classes of heat insulating materials?
57. In what ways are thermal insulation materials based on mineral fiber produced?
58. How are mineral and fiberglass produced?
59. What does the coefficient of thermal conductivity of heat insulation materials depend on?
60. What is vermiculite ?
61. What is the composition of very thin concrete?

62. How is gpovac and coppic concrete made?
63. Mineral and light organic fillers.
64. Requirements for modern lubricants.
65. Technology of continuous molding of reinforced concrete structures.
66. History of concrete and reinforced concrete production.
67. What should be considered when using covering materials in residential buildings?
68. What are glass-magnesium sheets ?
69. By what technology are plasterboard sheets produced?
70. What is a frame curtain?
71. What material is used to cover the outer surfaces of buildings?

VII. GLOSSARY

Fermacell board consists of paper pulp fibers and gypsum obtained during secondary processing of paper pulp.

"VELOKS" wood-cement boards.

Agloporite is a lightweight aggregate made by cooking 8-10% combustible mixtures with clay rocks in a specially installed agglomeration machine.

Armature (lat. armature - weapon, equipment, device) is a detail or a set of equipment that predicts their top performance without the main part of the machine, structure or facility being closed. In reinforced concrete, reinforcement is used to make the structure work well in bending. In reinforced concrete, reinforcement is used in the form of rods, ropes and frames, tops, etc. The reinforcement is installed in the construction zone to receive the shear force. This allows the resulting material to perform well both in compression and in compression. The good interlocking of reinforcement with concrete and having the same KLTR (linear expansion coefficient from temperature) ensures that reinforced concrete can be used in a wide range.

Concrete is an artificial stone formed as a result of the gradual solidification of a mixture consisting of a certain amount of ground binder, small and large

aggregates and water. As a result of the reaction of the binder with water, it is a closed complex cop component system consisting of particles of the binder, newly formed minerals, aggregates, water, sometimes a closed bag, and introduced air.

Concrete mixture is obtained by directly mixing water, cement and aggregates, which represents a polydispersion system with complex components.

Wollastonite is a polymer silicate with a very solid structure of its raw material.

Hydraulic binders - cure in both air and water, increase the strength of the opz in both air and water (better in water).

Clay tile is a building material in the form of angular tiles or rods, molded from clay and then baked.

Gypsum board is a decorative covering material, easy installation is not difficult. It is used only in the interior of the building. It is used in non-moisture conditions. Gypsum board is compacted by placing plasterboard between double-sided paperboard, and then dried.

Granular blast furnace slag is a waste product of the metallurgical industry. During metal extraction, a slag (5-10 mm) composed of coarse grains like large sand is obtained by rapidly cooling the solution blown onto the surface of the blast furnace.

Fuel slag and ash are lightweight concrete aggregates produced from the burning of crushed stone. Inorganic aggregates (for example, clay) in the clay melt at high temperatures and turn into a thin layer of hollow material.

Alkaline cement is a hydraulic binder based on aluminosilicate and alkaline constituents.

Keramogranite is an environmentally friendly material, its water absorption is 0.1-0.2% by mass. Keramogranite can be used not only for internal and external walls, but also for finishing ventilated facades , open balconies and verandas.

Expanded vermiculite - natural mountain rock vermiculite is obtained by baking at a temperature of 1000-1100°C with a cupping lid.

Cobbled perlite is a lightweight aggregate obtained by rapid cooking of vitreous rocks (perlites, obsidians) erupted from a volcano with a low water content (2-4%) at 950-1200°C.

Dry construction mixes are a mass consisting of several components, in addition to mineral binders and aggregates, their composition contains a complex of chemical additives to control the hardness and strength of the mineral binder, to predict that the mixture will achieve the necessary physical and mechanical properties after hardening .

Nanomaterial - optical dimensions 100 It is referred to the material which is smaller than nm and whose operational properties depend on the structural elements.

plasticizing additives - additives that increase the mobility of pastes (flowability, good flowability) despite the small amount of adhesion .

polymers - It is made up of high molecular compounds (resins) and consists of structural links whose molecules are repeatedly repeated. Based on their origin, polymers are divided into natural and artificial (synthetic) polymers.

Portland cement refers to the powdery material obtained by smoothing Portland cement clinker and gypsum together. An active mineral supplement or other supplements may be added during pregnancy.

Natural polymers consist of proteins, nucleic acids, natural rubber.

Glass block - this is a product made by connecting two pressed glass plates (half-blocks) and sealing the inside hermetically.

Glass magnesium board (SML, glass magnesium board) is a sheet covering material made of glass, the main components of which are glass magnesium board. oxide - (MgO) 40-50%, magnesium chloride ($MgCl_2$) – 30-35%, perlite (SiO_2, volcanic glass, as a sound insulating material in the material) 3-8%, sawdust - up to 15%, water, fiberglass, polypropylene fabric.

A glass package is a hermetically closed construction in which two or more sheets of glass are joined together by means of an intermediate frame and a hermetic seal.

Glass profiles are transparent or colored profiled bottles made by continuous rolling. Their surface can be smooth, concave or convex, absolutely transparent or opaque. Also, in order to give high strength to the structure, glass profiles reinforced with a metal top can be produced. They are produced in the form of sheets with a thickness of 6-7 mm, a width of 250 or 500 mm, and a length of no more than 7000 mm .

GLOSSARY

1. ***"Fermacell" -*** paper plate of secondary processing consists of fibers and plaster
2. ***"VELOX"*** - wood-cement boards for the optimum moisture content of 22% Boplo wood waste is used
3. **Agloporite** - argillaceous rock and 8-10% of combustible inclusions tour installed sintering machine to cook light Sunhing adder.
4. **The armature-** Fixtures weapons (machinery, equipment) - the parts or equipment yigpimi Boplo, machinery, construction, or the main part of the building Boplo, and the estimates of the performance of their topgpri. Reinforced concrete structure of armature for Best Performance by a bow. Reinforced concrete rods in the form of cored rope and frames, soil and. Fixture design is installed in the zone for the power switch. This material also allows you to run Compression. Reinforcing concrete with good bite and a different culture (temperature coefficient of linear expansion) suggests the possibility of renewing the use of reinforced concrete covering a wide range.
5. **Concrete -** known amounts of binder, small and large aggregates a mixture of water and mix slowly as a result of hardening Boplo Sunhing. He said as a result of the reaction of water binding matter particles created Boplo minerals, water, and sometimes when covered air Boplo complex Kopp component system.
6. **Wollastonite -** raw materials are very strong bonded polymer silicates **.**
7. **Hydraulic binding substances-** the air, water solidified the strength of OPZ in the air, water (water) increases

8. Clay tiles-- Pour into a mold of clay baked sopngra topgpri hexagonal tiles or building materials sold for a pittance
9. Drywall- decorative coating material Boplo, easy installation job Boplo. Only the inner part of the building will be used. Moisture conditions do not study. Drywall between the bilateral cardboard, plaster, dried and then pressed into the boptkasini
10. Alkaline cement - aluminosilicate alkaline component-based hydraulic astringent
11. **Nanomaterial -** small dimensions of 100 mm related to the elements of the design and operational characteristics of said material

Glossary

1. ***"Fermacell"* -** a paper plate made of secondary processing paper fiber and gypsum
2. ***VELOKS* -** wood-cement slabs for optimum moisture content of 22% wood
3. **Agloporit -** glinistaya poroda i 8-10% goryuchego prisoedinitsya spetsialnyy type po aglomashiny, chtoby prigotovit lightkuyu nachinku Sunhing .
4. **Armature** -(Lat. Svetitsya orujie yarogp , machine, oborudovanie) - sbor chastey ili oborudovanie, technics, stroitelstvo, ili oni ne yavlyayutsya osnovnoy chastyu zdaniya, oni pravlinnoy ugadat. Iron-beton construction armature for the achievement of results with the help of the hatch. Iron-reinforced concrete sterzhni poroshkovaya verevki in the form of ramy, pochvy i in the form . Crepej design cooking zone for pitani cooking is installed . This material also allows you to jump on a shoestring . Armirovanie betona s horoshim prikusa i drugoy kultury (temperature coefficient of linear expansion) predpolagaet vozmojnost vozobnovleniya ispolzovaniya shirokogo spektra lezobetona.
5. **B eton** -Izvestnye ssylki dlya izmereniya kolichestva veshchestva, smes melkix i krupnyx zapolniteley i vody v smesi postepenno formiruetsya v razulte uprochneniya Sunhing . On vyazyvaet vodu v rezultsii reaktsii vyazyvaniya chastits materii, a vnov obrazovannye mineralnye polniteli, vodu, add some additional services, no vozdukh predstavlyaet soboy slojnuyu mnogokomponentnuyu system
6. **Hydravlicheskoe vyajushchee veshchestvo -** vozdukh, voda zatverdevaet svoi sily v vozdukhe, vode (vody) vozrastaet
7. **Glinyanaya cherepitsa -** The mold is made of clay, and then it is sealed in the form of a rectangular tile with a wall-free building material.
8. **Plasterboard** - decorative material pokrytiya, light installation work. Budet ispolzovatsya only vnutrennyaya chast zdaniya. Humidity affects neither the air nor the surrounding environment. Gypsum cardboard is made of double-sided paper and cardboard, gypsum, plaster, and then pressed and sealed.
9. **alkaline cement -** alyumosilicat shchelochnogo komponenta na osnove hidravlicheskogo vyajushchego

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