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ECOLOGICAL BUILDING MATERIALS AS THE MAIN COMPONENT OF THE URBAN DEVELOPMENT TREND

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Abstract This article discusses the main directions of the construction of buildings and structures using environmentally friendly building materials. Some environmentally friendly materials currently in use are described.

Key words. bamboo, bamboo fittings, building material, green concrete, geopolymer concrete, ash, gas, ecology, construction

It's no secret that construction has an impact on the environment. Under the buildings are changing: soil, terrain, groundwater, moisture evaporation, vegetation intensity and much more. All these criteria must be observed when planning and building, so as not to upset the balance between man and nature. It is important to use environmentally friendly materials in construction.

Ecologically safe materials are those whose creation does not affect the environment and other objects. There are two types of building materials:

1) Absolutely environmentally friendly (stone, wood, rubber, straw, cotton, etc.);

2) Conditionally environmentally friendly (brick, foam concrete blocks, tiles, etc.). Conditionally environmentally friendly materials are used to a greater extent, they are as safe as absolutely environmentally friendly, but have the highest technical indicators [3, p. 35–37].

The most environmentally friendly roofing materials include: ceramic tiles and sheet copper.

As a heater, you can apply: mineral wool, wood boards and ecowool (made from cellulose).

In urban planning, Green Buildings, which have minimal impact on the environment, have become popular, now they are being built around the world.

In the Russian Federation, "Green" technologies are not yet so popular, but there are already examples of such houses in Moscow, Moscow Region and St. Petersburg.

Environmentally friendly building materials tend to differ in price. Priority upward, which leads to higher prices for objects, and sometimes downward. The choice is up to the construction company to save on the cost of materials and pollute the environment or build environmentally friendly facilities.

1. Bamboo fittings

Developing countries have a high demand for monolithic construction, but often do not have the means to produce steel for monolithic reinforced concrete. Scientists propose, in areas where there is a shortage of steel, to use bamboo instead of reinforcement.

Bamboo is one of the environmentally friendly ancient building materials that has been and is used to build houses in areas where there was an abundance of plants, especially in South America, Africa and Southeast Asia.

An ideal place for bamboo growth is a completely waterless area. These trees usually grow quickly on sandy and clay soil. Organic soil inhibits bamboo growth. The life of a bamboo tree is usually from 20 to 100 years.

To use bamboo for construction, it is usually first harvested and then dried. Two methods are used for drying:

1. Air drying - it is simple and economical (takes 5 to 10 weeks)

2. Hot drying - impregnated bamboo with an aqueous solution of iron sulfate is dried, subjected to heat treatment and cooled. This method is long and laborious.

Properties of bamboo as a building material:

- The tensile strength of bamboo is very high if we compare it with steel. The reason for this is that bamboo fibers usually extend axially (parallel to its length).

- If you measure the compressive or tensile strength of bamboo in the right direction, then many of its types are 11.2 times stronger than steel. However, bamboo is weak in the direction perpendicular to the axis of the trunk and the tangent circle on the surface, as well as when acting from the inside on the wall.

- Bamboo has a low weight, which contributes to quick installation and transportation.

- Bamboo has high fire resistance. Bamboo has very good elastic characteristics. It can be used in earthquake zones due to its elastic nature.

As you can see, a durable bamboo has all the necessary qualities to replace steel when necessary, this stability is ensured by the tubular structure of the bamboo stems formed during evolution under the influence of winds.

Despite a number of advantages, this building material has some disadvantages that limit its mass use in construction. Moisture is the main enemy of bamboo,

because it increases the risk of attack by fungi and insects. Therefore, the best time to collect bamboo is the cooler season.

fig. 1 Bamboo Fixtures

Bamboo is a rather economical building material with great prospects for use. It is of great importance in areas where there is a high risk of earthquakes. Japan is a country that uses bamboo in the construction of houses due to too many earthquakes.

2. Green Concrete

Concrete is precisely that building material from which almost everything is made up in cities: houses, bridges, overpasses, sidewalks, etc. The value of this gray material is not in doubt. However, concrete production causes irreparable damage to the environment. Modern architects and builders are trying to find a "green" alternative to concrete and use a variety of environmentally friendly materials in the construction of houses.

Most people associate green concrete with pigmented concrete. But in the context of this topic, "green" concrete means environmentally friendly concrete, which uses less energy and carbon dioxide in its production than regular concrete.

Engineers and architects have a choice of materials and products that they use to develop projects - when it comes to the frame of a building, they usually choose between concrete, steel and wood.

Concrete is one of the most widely used structural building materials in the world. High-quality concrete that meets specifications requires a new standard in process control and material optimization. Concrete is increasingly recognized for its strong environmental benefits in support of creative and effective sustainable development.

Basic recipe for the preparation of "green" concrete.

To prepare 20 kg of eco-concrete, you will need:

- ash - 6.6 kg
- liquid glass - 4.0 kg,
- potassium hydroxide - 1.8 kg,
- slag - 6.6 kg
- water - 11 l.

When working with aggressive potassium hydroxide, personal protective equipment must be used.

Environmental benefits of use.

This building material has the following advantages:

1. Durability. Structures built using geopolymer concrete are more likely to survive a fire (it can withstand temperatures up to 2400 degrees Fahrenheit).
2. Corrosion resistance. What is important, taking into account the impact of pollution on the environment (acid rain significantly reduces the life of traditional building materials).
3. Uses industrial waste. Instead of 100% Portland cement mixes in "green" concrete, 25-100% fly ash is used. Fly ash is a by-product of coal burning and is collected from the chimneys of industrial plants (such as power plants) that use coal as an energy source. There is a large amount of this industrial waste. Hundreds of thousands of hectares of land are used to remove fly ash. A significant increase in the use of geopolymer concrete in construction will make it possible to use fly ash and, we hope, will release many hectares of land.
4. Reduces energy consumption. If you use less Portland cement and more fly ash when mixing concrete, you will use less energy. The materials used in Portland cement require huge amounts of coal or natural gas to heat it to the appropriate temperature, turning them into the appropriate material.
5. Reduces greenhouse gas emissions. Green concrete production reduces greenhouse gas emissions by up to 90%.
6. Frost resistance.
7. Affordable price. It enables middle-income customers to purchase material and implement construction using green concrete.
8. The ability to make building materials with your own hands at home using available ingredients.
9. Low density. The use of lightweight concrete significantly reduces its own load on the structure.

Applicability in designs.

Green concrete can reduce the facade's own weight from 5 tons to 3.5 tons, the load on the crane, ensure ease of loading and unloading and ease of lifting, thereby reducing construction time. Good fire resistance, sound insulation than traditional material.

Restriction.

Geopolymer concrete, like any other building material, can not do without limitation. When using stainless steel, the cost of reinforcement increases. Structures built from "green" concrete have a relatively shorter service life than structures made from ordinary concrete. The breaking strength of "green" concrete is less than that of ordinary concrete.

"Geopolymer cement will undoubtedly be widely used," said Professor Erez Elloche, who developed the idea of "green" concrete. "We expect to see a growing number

of commercial applications of this innovative green technology, both in the construction industry and in the field of transport infrastructure."

Researchers continue to work and experiment on creating cement, consisting of industrial waste. The next generation of geopolymer cement will be several times more resistant to damage than conventional cement.

I would like to note that modern urban planning, which ensures the aesthetic appearance of cities and environmental safety, using environmentally friendly building materials, is an urgent and sought-after direction in the development of the construction industry.

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