The economic feasibility of the construction of buildings of fibre-reinforced concrete.

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Abstract

The article presents information on the project for the construction of low-cost and environmentally friendly housing based on doped cellular fibrous concrete. The project provides for the development of technologies for the construction and reconstruction of public and residential buildings, including those built on standard structures based on structural units. As a result of the project, the technology of construction and reconstruction of public and residential buildings will be substantiated and developed. Fibroconcrete is a high-tech material for construction, obtained by adding fiber to concrete. Fiber - microarmature, reinforcing concrete in all planes, increasing the brand, strength, impact resistance and reduces the formation of shrinkage cracks. Steel fiber is a product made from steel wire (anchors) at the ends, which adhere to concrete and accept the arising stresses

Key words: Engineering and technical activity, technology, fiber-reinforced concrete, energy saving, low cost, durability, ecology, comfort

Content

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1. Introduction

The problem of energy saving in Russia is very acute, it is recognized at the state level - in 2009 the Law on Energy Efficiency was adopted, providing for an integrated approach to its solution. The main goal of the measures envisaged by the Law is to reduce energy consumption during the operation of buildings. At the same time, the fulfillment of energy efficiency requirements should be guaranteed by the developer for at least five years from the moment the building is put into operation.

In this regard, it should be noted the durability of cellular non-autoclaved fiber-reinforced concrete, comparable to the life of the building, in contrast to similar materials. Important advantages of cellular non-autoclaved fibrous concrete: energy saving, low cost, durability, ecology and comfort.

The structures of cellular fiber-reinforced concrete are capital and durability due to increased frost resistance is not less than 100 years.

The cellular fibrous concrete "breathes", regulating the humidity in the room and contributing to the removal of harmful gases. The material has a low content of natural radionuclides (10 times lower than normal). Due to the high porosity, cellular concrete is a good sound insulator. Buildings made of cellular concrete do not film useful for human natural electric and magnetic fields. Cellular concrete has an excellent thermal insulation capacity due to the air enclosed in its pores. Elements of wall fences have resistance to heat transfer R = 6 m2 g / W at a thickness of 400 mm, which is equivalent to a brick wall 3.5 m thick or a wooden wall 80 cm thick.

The wall of doped cellular concrete at a cost of 2-3 times lower than the wall made of bricks, and the quality is much higher. The low thermal conductivity and heat-accumulating properties of the cellular concrete of the wall give significant savings on heating.

2. Goals and objectives

The project provides for the development of technology for the construction of energy-efficient, affordable and eco-friendly housing from doped cellular fibrous concrete. R & D is aimed at solving the following scientific and technical problems:

- the organization of mini-production from alloyed cellular concrete directly on the building site of products of a wide range of nomenclature;
- location of production in a heated room or in the open air;
- adjustment of the equipment, level of mechanization, productivity and cost of the sets in a wide range, depending on the capacity of the mixer, the number and type of forms;
- reduction of cost, labor and construction time;
- improving the quality of the thermal insulation of the entire circuit, - reducing the environmental impact of buildings on the environment;

3. Description of the study

The novelty of the solutions proposed in the project is based on the studies carried out, which show that the developed technology for the construction of «Affordable and effective housing» from cellular non-autoclaved fibrous concrete is optimal for ecology, fire safety, durability, high thermal protection and low operating costs.

The project is based on the development of a new construction technology that will reduce energy costs, in addition, it will be durable and competitive in terms of price. It is supposed to conduct a number of experiments that will allow to reveal in practice all the pros and cons of this system, as well as its feasibility.

Cellular fibrous concrete is a stone foam consisting of 30-80% of pores with a diameter of 0.1-3.0 mm, evenly distributed throughout the volume. It is made of binder, fine aggregate, water and special additives.

This ecological material is a generalization of many years of experience in the production and use of cellular concrete manufactured by intensive non-autoclave technology. About 1500 units of one or three storey residential buildings and garages were made and successfully used from this material. This effective material was used for the construction of industrial and administrative buildings and centers with a wall height of up to 9 m. With the application of blocks, the boiler house was repaired, the school overhauled, the reconstruction of shops, apartment buildings, etc.

The expected result is the choice of this technology at international tenders for the construction of low-rise housing in the neighboring states. Also interested in the introduction and use of real technology in low-rise construction.

Analysis of the situation in the construction market showed that there are many alternative building materials. But they all have certain drawbacks. In addition, it can be said with certainty that demand for cellular fiber-reinforced concrete is growing, as many consumers have already estimated the economy, environmental friendliness and durability of this product.

4. Plan for development of the enterprise

Table1. Quantitative results

№ p / p	Name of product	Characteristic	Unit of measurement	Value
1	YALNF unit	400mm * 200mm block 300mm *	m	2264
2	YALNF unit	Block 400mm * 200mm * 400mm	m	2800
3	"Box" at home of polumansardnogo blocks 400mm * 200mm * 300mm	Total living area	m	4450
4	"Box" at home of polumansardnogo blocks 400mm * 200mm * 400mm	Total living area	m	5055

Table 2. Workplaces

1st year of the project	2nd year of the project	3rd year of the project	in total
6	19	35	35

5. Action plan for the project

Table 3.Work schedule

Phase number	Name of work on basic research and development stages	Turnaround time (beginning-ending mes.god)	Phase value, RUR.	The shape and form of reporting
1	Stage 1	March 2014- May 2014	250000	
1.1	Analysis of existing technical and technological solutions.	March 2014	125000	Annotation of scientific and technical report. Acceptance Certificate of work on sub-step
1.2	Substantiation of technology and methods of construction and installation work and organizational methods of construction works. Substantiation of technology and methods of reconstruction works to improve the thermal efficiency, safety and comfort of accommodation. Justification of architectural and urban construction solutions. Marketing research.	April 2014 - May 2014	125000	Scientific, technical and financial reports. Acceptance Certificate of work on sub-step
2	Stage 2	June 2014 - August 2014	250000	

Phase number	Name of work on basic research and development stages	Turnaround time (beginning-ending mes.god)	Phase value, RUR.	The shape and form of reporting
2.1	Assessment of the socio-economic efficiency of the construction and reconstruction of residential buildings Estimation of efficiency of investment projects of reconstruction of buildings.	June 2014	125000	Annotation of scientific and technical report. Acceptance Certificate of work on sub-step
2.2	Organization YALNF-production units (rental of industrial premises, purchase and installation of equipment for the production). Organization of the campaign. Organization of industrial cooperation.	July 2014 - August 2014	125000	Scientific, technical and financial reports. Acceptance Certificate of work on sub-step
3	Stage 3	September 2014 - November 2014	250000	
3.1	Conclusion of contracts for the construction and / or renovation of buildings. Obtaining permits.	September 2014	125000	Annotation of scientific and technical report. Acceptance Certificate of work on sub-step
3.2	The construction of 2-3 buildings.	October 2014 - November 2014	125000	Scientific, technical and financial reports. Acceptance Certificate of work on sub-step
4	Stage 4	December 2014 - February 2015	250000	
4.1	The construction of 2-3 buildings.	December 2014	125000	Annotation of scientific and technical report. Acceptance Certificate of work on sub-step
4.2	Evaluating the effectiveness of the technology and methods of construction and installation work and organizational methods of construction works. Formulate recommendations and standard routings.	January 2015 - February 2015	125000	R & D report and financial report. Acts of acceptance of work on the sub-step and the contract as a whole
in total			1000	

6. The planned schedule for the project

Table 3. The planned schedule for the project

Step (year)	Sub-step	Name of works	Deadlines	Source of financing	Cost, rub.
1	1	Stage 1	March 2014 - May 2014	Ltd	250000
1	1.1	Analysis of existing technical and technological solutions.	March 2014	Ltd	125000
1	1.2	Substantiation of technology and methods of construction and installation work and organizational methods of construction works. Justification stroitelnyhrabot technology and techniques to improve thermal efficiency, safety and comfort of accommodation. Marketing research.	April 2014 - May 2014	Ltd	125000
1	2	Stage 2	June 2014 - August 2014	Ltd	250000
1	2.1	Assessment of the socio-economic efficiency of construction public and residential buildings. Evaluating the effectiveness of investment projects of reconstruction of buildings.	June 2014	Ltd	125000
1	2.2	Organization YALNF-production units (rental of industrial premises, purchase and installation of equipment for the production YALNF panels). Organization of the campaign. Organization of industrial cooperation.	July 2014 - August 2014	Ltd	125000
1	3	Stage 3	September 2014 - November 2014	Ltd	250000
1	3.1	Contracts for the construction of buildings with a superstructure floors. Obtaining permits.	September 2014	Ltd	125000

Step (year)	Sub-step	Name of works	Deadlines	Source of financing	Cost, rub.
1	3.2	The construction of 2-3 buildings.	October 2014 - November 2014	Ltd	125000
1	4	Stage 4	December 2014 - February 2015	Ltd	250000
1	4.1	The construction of 2-3 buildings.	December 2014	Ltd	125000
1	4.2	Evaluating the effectiveness of the technology and methods of construction and installation work and organizational methods of construction works. Formulate recommendations and standard routings.	January 2015 - February 2015	Ltd	125000
2	1	Assessment of the socio-economic benefits of the construction of public and residential buildings. Evaluating the effectiveness of investment projects of reconstruction of buildings.	March 2015 - February 2016	Ltd	2000000
2	2	Conclusion of contracts for the construction of buildings. Obtaining permits. The construction of 3-6 buildings.	March 2015 - February 2016	Ltd	2000000
3	1	Evaluating the effectiveness of the technology and methods of construction and installation work and organizational methods of construction works. Formulate recommendations and standard routings.	March 2016 - February 2017	Ltd	3000000
3	2	Contracts for the construction of buildings with a superstructure floors. Obtaining permits. The construction of 6-8 buildings.	March 2016 - February 2017	Ltd	3000000

Step (year)	Sub-step	Name of works	Deadlines	Source of financing	Cost, rub.
in total					11000000

7. Conclusion

1. The developed technology for the construction of "Affordable and effective housing" from cellular non-autoclaved fibrous concrete is optimal for environmental friendliness, fire safety, durability, has high thermal protection and low operating costs.
2. The expected result is the choice of this technology at international tenders for the construction of low-rise housing in the neighboring states. Also interested in the introduction and use of real technology in low-rise construction.
3. It is advisable to promote the project's products in the construction industry. This effective material will find its application in the construction of industrial and administrative buildings, centers with a wall height of up to 9 m., Repair of boiler houses, schools, reconstruction of shops, apartment houses

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Экономичное и экологическое строительство из фибробетона.

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Информация о статье УДК 69.003.13

Аннотация *В статье представлена информация о проекте строительства недорогого и экологически чистого жилья на основе легированного клеточного волокнистого бетона. Проект предусматривает разработку технологий для строительства и реконструкции общественных и жилых зданий, в том числе построенных на стандартных конструкциях на основе структурных единиц. В результате проекта будет обоснована и развита технология строительства и реконструкции общественных и жилых зданий. Фибробетонон — высокотехнологичный материал для строительства, получаемый добавляя фибру в бетон. Фибра — микроарматура, армирующая бетон во всех плоскостях, повышающая марку, прочность, ударостойкость и снижает образование усадочных трещин. Стальная фибра представляет продукт, производимый из стальной проволоки (анкерами) на концах, которые сцепляются с бетоном и принимают возникающие напряжения*

Ключевые слова: Инженерно-техническая деятельность, технология, железобетон, энергосбережение, низкая стоимость, долговечность, экология, комфорт.

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