

The Design of Residential Buildings with the Use of Foam Concrete in the Village

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To cite this article:

Atamurotov Odilbek Egamberganovich, Iskandarov Usmon Iskandarovich. The Design of Residential Buildings with the Use of Foam Concrete in the Village. *Landscape Architecture and Regional Planning*. Vol. 4, No. 1, 2019, pp. 1-4. doi: 10.11648/j.larp.20190401.11

Received: December 26, 2018; **Accepted:** January 14, 2019; **Published:** February 13, 2019

Abstract: The article analyzes typical projects of exemplary residential buildings for construction in rural areas. The meaning of the article is to introduce some changes to improve the quality of buildings, reduce construction time and reduce the estimated cost of the object. As well, the article justifiably sets forth new methods for approaching the construction of residential buildings in rural areas. An example of such a material is foam concrete. This material is lightweight, porous, durable, as well as economical. The use of such materials reduces the construction time of facilities.

Keywords: Architectural Complex, Architectural Structures, Groundwater Level, Residential Building, Excessive Expenditures

1. Introduction

The development and improvement of the territories of populated areas is an important architectural and town-planning problem. Any city, village, rural settlement, architectural complex or a separate building are built on a specific territory, site, characterized by certain conditions, a level, standing level of groundwater, danger of flooding by flood waters, etc. To make the territory most suitable for the construction and operation of architectural structures and their complexes without excessive expenditures by means of engineering training [1].

In the development of master plans for the development of cities and urban agglomerations, a set of measures is planned for the development of little-use plots located within and outside the city limits, for construction not only for urban but also for rural construction. The combination of these activities, or the engineering preparation of the territory, includes the design and construction of elements of vertical planning, surface water, lowering the groundwater level (in the Khorezm region, the groundwater level ranges from 0.5 meters to 1.0 meters from the ground), combating erosion processes (ravines, landslides, mudflows), protecting the area in the reservoir zone, reservoirs and rivers from flooding and flooding, recultivation of areas disturbed by mining [2].

During the construction and operation of populated areas

and individual architectural structures, inevitably, there are tasks to improve the functional and aesthetic properties of the territory - its landscaping, watering, lighting, and so on, which is provided by urban beautification facilities. Rhetoric [3].

Works based on methods and methods for changing and improving the physical properties of a territory or protecting it from adverse physical and geological influences usually refer to the engineering preparation of a territory, and work related to improving functional and aesthetic qualities already the territories prepared in engineering relation - for engineering improvement [4].

Scientific and technological progress opens up new opportunities not only in areas of development of industrial technologies or in fundamental scientific research. In the field of applied disciplines, one of which is the engineering preparation and improvement of urban areas, the development of productive forces based on the achievements of science and technology also opens up new horizons. First of all, this can be attributed to significant progress in the field of earth-moving equipment, improving the forecasting of earthquakes, floods, mudflows, avalanches and so on. The use of all these achievements in the practice of urban planning can fundamentally change our understanding of the feasibility of carrying out certain engineering activities in their

traditional form, about the design methodology and technology for their implementation [5].

In connection with the rapid development of industry, energy, transport, the territories of inhabited places are increasingly beginning to experience negative effects from harmful emissions and sinks, noise, electro-magnetic emitters and other adverse phenomena. The basis of the fight against these phenomena, as a rule, are engineering measures. Therefore, the engineering basis for environmental protection can also be considered an essential component of the improvement of urban and rural areas.

The transition to intensive methods of work, improving their quality poses serious tasks for architects in the field of development, preparation and well-being of populated areas. Intensification of the use of urban land, for example, is impossible without the active development of so-called "junk" or "inconvenient" lands free from development by means of their engineering training. The expressiveness of the building depends largely on the quality of the external improvement, and the protection and improvement of the urban environment depends on the effectiveness of environmental engineering measures [6].

Recently, in the sphere of construction in the Republic of Uzbekistan, great changes have occurred, especially in the construction of rural residential buildings.

In October 2016, after the release of the Resolution of the President of the Republic of Uzbekistan on improving the design of residential buildings with a reduction in the area of the site to 400 square meters (schematic drawing), and a noticeable decrease in the cost of residential buildings for people in need of residential space, mass construction began throughout the country.

With the expansion of individual construction in the Republic of Uzbekistan, the need for building materials increases every day.

The use of thermal insulation materials and products in the construction of industrial and public buildings allows to provide high heat and sound insulation properties of building structures and reduce the thickness and mass of walls and other enclosing structures, and, consequently, the consumption of basic building materials (cement, metal, brick), and also labor and reduce construction costs.

2. Materials and Methods

In the process of industrialization of construction it is planned to reduce the costs of material, labor and financial resources. One way to reduce costs is to use lightweight concrete from local raw materials (one of the main components is fine-grained washed local sand). This material is foam concrete, which is already used in many countries around the world. Depending on the brand of medium density, foam concrete is used both as a heat-insulating material, which has a predominantly closed porosity, and as a structural heat-insulating material for enclosing structures,

and also as a construction material (see the photo of foam concrete) [7].

For modern housing construction, it is necessary to introduce innovations with the replacement or alternation of bricks and lightweight concrete, that is, concrete in such areas (structures) of the object as heaters for coatings and floors, partitions, self-supporting walls, outbuilding facilities, storage rooms, a fence for garden fencing, fence fences walls of the facade of the building, external toilets and other objects that do not require special strength characteristics of structures (see the working drawing of the plan of the walls). When analyzing the object and determining the advantages of the proposal, it is proposed to design the replacement of the following structures:

- a heat insulation layer for covering from reed plate 250 mm thick on a reinforced concrete plate on foam concrete plates of the brand D300, size 100x300x600mm, and weighing 5.8 kg each (see table No. 1).
- walls of partitions from burnt brick to foam concrete blocks with dimensions 100x300x600mm, marks D300, each weighing 5.8 kg.
- walls of parapets around the perimeter of the building with height from 0.5 meters to 0.7 meters from burnt brick to foam concrete blocks with dimensions of 200x300x600 mm, D300 brand, each weighing 11.7 kg.
- walls of outdoor toilet and storage room made of baked bricks for foam concrete blocks with dimensions of 200x300x600 mm, D400 marks weighing 15.6 kg each.
- walls of the garden fence and enclosing walls of the front part of baked brick to foam concrete blocks with dimensions of 200x300x600mm, D500 marks weighing 19.4 kg each.

Dimensions of foam blocks	Weight depending on the brand of foam concrete									
	D300	D400	D500	D600	D700	D800	D900	D1000	D1100	D1200
Wall foam blocks										
200x300x600	11,7	15,6	19,4	23,3	27,2	31,7	35,6	39,6	43,6	47,5
Partition foam blocks										
100x300x600	5,8	7,8	9,7	11,7	13,6	15,8	17,8	19,8	21,8	23,8

Figure 1. Physico-mechanical characteristics of foam blocks.

3. Results and Discussion

In this case, the replacement of construction materials will lead firstly to an improvement in the quality of built houses, secondly the construction period will decrease, thirdly the construction cost will decrease, and this in turn is economically feasible and can save a certain amount for both the state and residents of newly built residential buildings. To substantiate changes to the project of residential buildings, we give the calculation for one house as follows:

The surface area of the coating plates is 62.32 square meters (7.6 x 8.2 m), and the volume of an utelitel (laid foam concrete) is 6.2 cubic meters. According to the estimated cost of laying reed plates for the entire area of the slab cover for one house is -1 288 804 soums. The cost

of 1 cubic meter of foam concrete is -55,000 soums, which means the cost of foam concrete insulation for one house is (6.2x55000) -341,000 soums. The difference between the reed plate and foam concrete insulation amounts to 947,804 sums of direct costs for one residential building [8].

The total length of the partitions of a 2-bedroom apartment building (drawing the plan of the walls) is 23.56 pagon meters with a masonry height of 3.20 meters, the volume of brickwork is 75.392 cubic meters. The cost of the 1st cubic meter of brickwork is equal to 1,85292 soums, which means the cost of masonry walls of the walls of the entire house is 13 969 535 soums (without overhead).

At a cost of 1 cubic meter of foam block 55,000 soums, the cost of partitions of a single house of foam concrete material is 4,146,560 soums. Financial-summary analysis clearly shows that when using materials for the device of partitions, the difference between brickwork and foam concrete masonry amounts to 9,823,000 sums of direct costs for a single dwelling house [9].

The next section of the analysis is the parapet walls of a residential building with a total brick volume of 12.08 cubic meters. At the cost of 1 cubic meter of brickwork equal to 185292 soums, the cost of the brickwork of the walls of the parapet of the whole house is 2 238 327 soums (without overhead).

At a cost of 1 cubic meter of foam block masonry 55,000 soums, the cost of the parapet of one house of foam concrete material is 665,400 soums. The difference between the brickwork and the foam concrete masonry amounts to 1,572,927 sums of direct costs for one residential building. The interior walls of the walls of the rooms are made without the use of plaster using sandless coatings, while for the finishing work on one house, it saves 2,462,548 soums [10].

4. Conclusion

Replacing the brickwork of the outdoor toilet and the storage room with foam concrete blocks will save up to 1 168 216 soums, and replacing the brickwork of the external fence (fence) will save 1 498 358 soums for each house. From the above calculations the following conclusion follows:

During the construction of model houses using foam concrete blocks for attic insulation, masonry partitions, parapet walls, outdoor toilet and

pantry, as well as the external fencing (fence) of the kindergarten and the fence of the front part of the savings for one house is 17472343 soums.

Taking into account all overhead costs, this amount will amount to 20,429,585 soums. From this it follows that each resident can save the above amount of money on the construction of his house. In addition, instead of five residential buildings, it will be possible to build six such exemplary residential buildings.

Appendix



Figure 2. Photo based on the master plan of Tashkent.

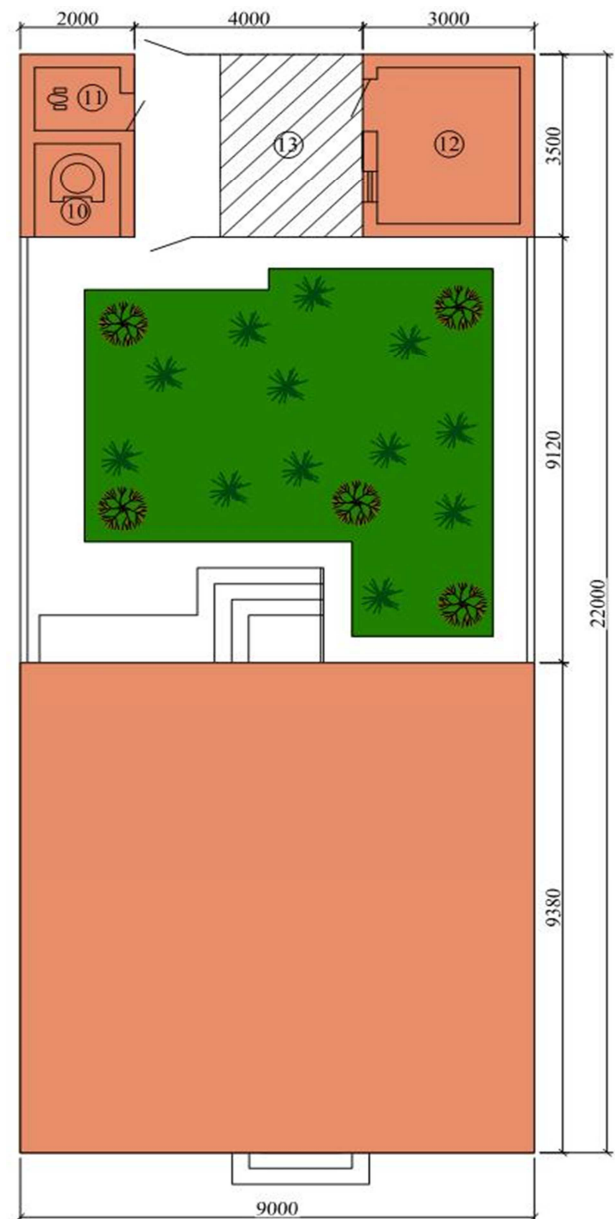


Figure 3. Common scheme of the standard layout scheme Dimensions 9000 x 22000mm. And its surface is 198 m².

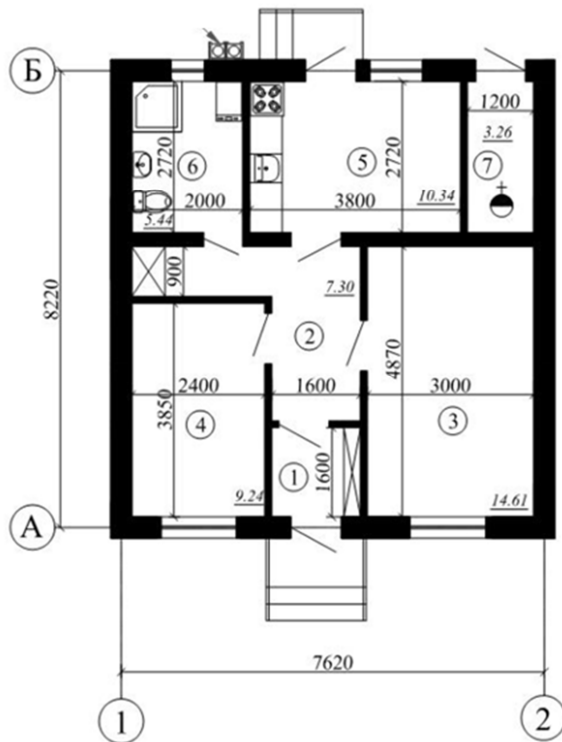


Figure 4. Wall drawing scheme of residential building.



Figure 5. Penetrating internal structure appearance (pores).



Figure 6. The finished product is penobetone. Dimensions-100x300x600mm.



Figure 7. The finished product is penobetone. Dimensions 200x300x600mm.

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