PROCESS OF DESIGNING AND CONSTRUCTING BRICK BUILDINGS FOR ENERGY EFFICIENCY MEASURES

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Annotation
In this article shown the process of designing and repairing brick buildings using ceramic facade tiles with an ECOVER 50 mm insulation layer and an air gap of 50 mm. can be cause of increasing energy efficiency, enhancing the artistic and architectural appearance of the building, actively influencing the temperature changes in various sections of the external wall structure.

Key words: ECOVER, designing, brick, energy, economical, efficient, reconstruction, thermo-sensor, temperature changes.

1. Introduction

Since reaching independence, the Republic of Uzbekistan has carried out reforms in almost all areas and is still making great strides. For more than half a century of development, our country has achieved great success in various fields. At present time our country is one of the strongest industrially developed countries in the world. A case in point the work carried out in the sphere of construction plays an important role in building modern residential and public edifice in our country, increasing the demand for their energy efficiency, and advancing our cities.

In 2015 on 5th may the president of Uzbekistan signed resolution №2343 according to this “The program of measures to introduce energy-saving technologies and reduce energy consumption in the economy and social sphere from 2015 till 2019 years" and resolution №4422 of August 22, 2019. "On urgent measures to improve energy efficiency in the economy and social sphere, introducing energy-saving technologies and the development of renewable energy sources" these serve as a key energy efficiency program in the design and renovation of buildings [1, 2].

2. Ways and methods.

Nowadays, brick buildings are morally and physically obsolete as a result of the tightening of modern requirements for their convenience, artistic and architectural appearance, as well as the properties of thermal protection, so long as they are being built according to impractical norms and rules.

The fund of residential and public buildings in the country is 470 and 115 million square meters, corresponding to their account for 50% of total energy consumption, including 64% of natural gas consumption. Most of these buildings were built in according to the old Union building codes, the aim of which was to save on basic building materials.

The outer wall of brick houses under construction in all regions of the country consists of 1.5 bricks (380 mm), which mainly performs 2 functions. On the one hand, it supports the weight of the building and ensures its durability, on the other, it must protect the building itself from the cold of winter and heat of summer. An outer wall of 1.5 bricks (380 mm) can correspond to requirements for load-bearing capacity and strength, but the new building regulation 2.01.04-97* does not even correspond to demands of Table 2a "Building Heat Engineering" [3].

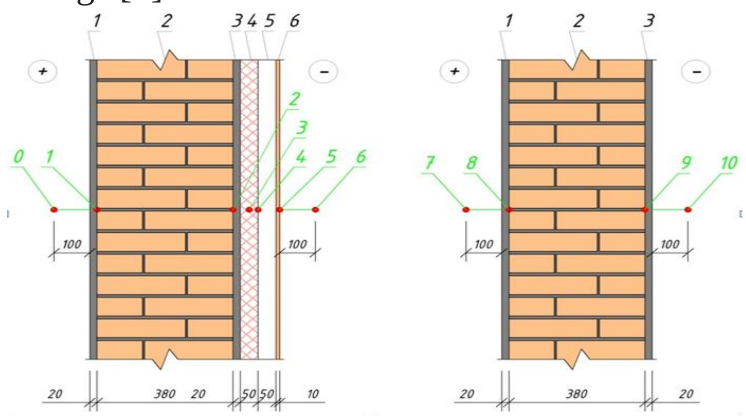
The energy efficiency of a building mainly depends on its exterior walls, roof, doors and windows. Therefore, the correct use of protective coatings can save 50% of the energy which needed to heat buildings.

3. The results and discussion

In the process of repairing brick houses, the main goal was to develop, scientifically substantiate and recommend projects for the repair of energy-efficient wall structures.

In the process of renovating brick buildings, it was necessary to determine the energy efficiency advantages over other similar traditional cases by using ceramic facade tiles with an ECOVER 50 mm insulation layer and a 50 mm air gap on the external envelope.

In order to do original research work, a sample with a special design solution was made from the outside of the outer wall, consisting of an ECOVER insulating layer, an air gap and a ceramic facade tile [4].



Picture 1. Schemes for the construction of external walls before and after renovation:

thermal sensor;
0 - the thermal sensor is installed 100 mm above the repaired internal plaster wall:
1 - thermal sensor installed inside the repaired interior wall plaster;
2 - thermal sensor inside the repaired external wall plaster;
3 - ECOVER thermal sensor installed on the middle part of the heat-insulating material;
4 - ECOVER thermal sensor installed over the heat-insulating material;
5 – thermal sensor, mounted on top of a ceramic tile;
6 – thermal sensor installed 100 mm above the tile surface;
7 - Thermal sensor, installed at a distance of 100 mm from the inner surface of the non-repaired wall.
8 - thermal sensor installed inside the non-repairable internal plaster of the wall;
9 - thermal sensor installed inside the unrepaired external wall plaster;
10 - thermal sensor installed at a distance of 100 mm from the outer surface of the wall being repaired;
The results of the study of temperature changes in various sections of the structure of the external walls after repair are shown in Table 1.

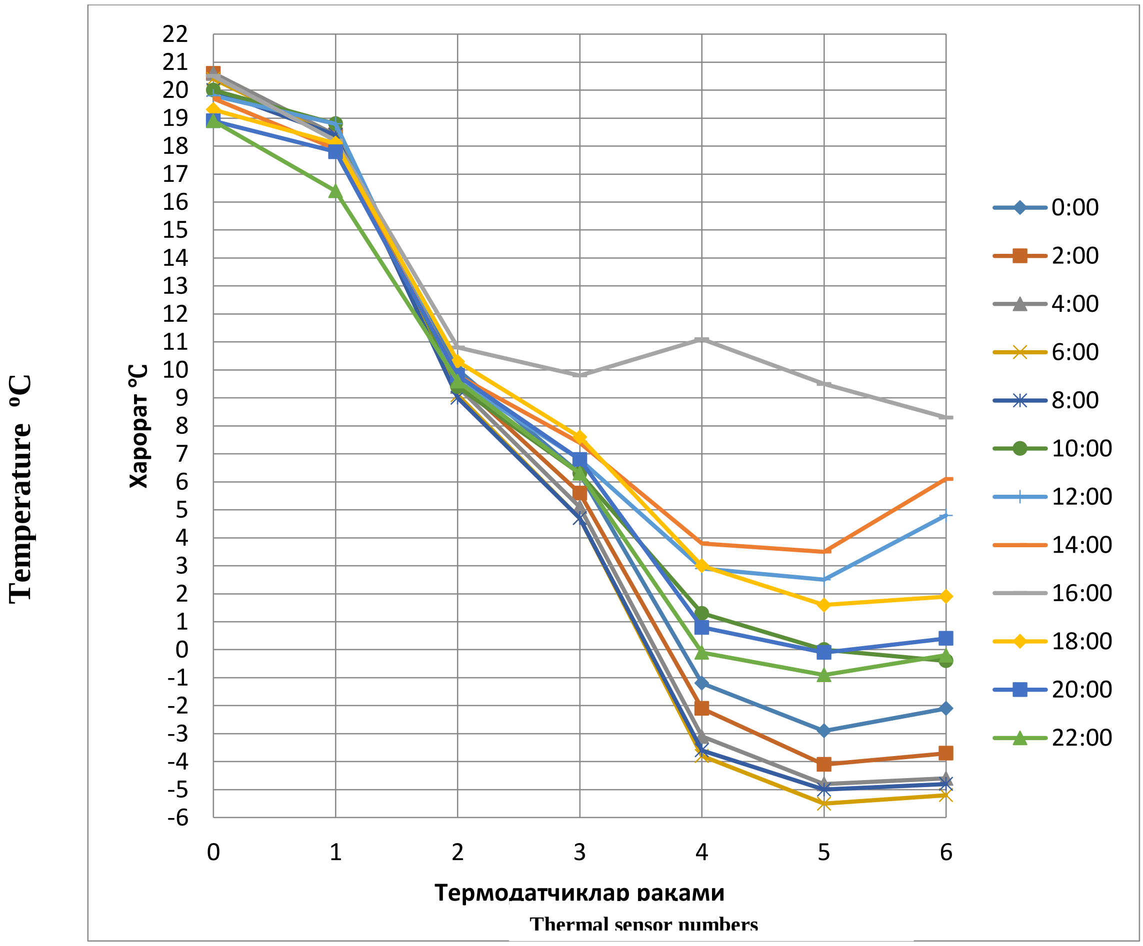


Diagram 1. Temperature differences in various sections of the external wall structure after repair.

Table №1

Thermal sensor	Time											
	0:00	2:00	4:00	6:00	8:00	10:00	12:00	14:00	16:00	18:00	20:00	22:00
0	20.6	20.6	20.6	20.4	20	20	19.8	19.7	20.5	19.3	18.9	18.9
1	18.2	18.4	18.4	18.3	18.4	18.8	18.8	17.9	18.2	18.1	17.8	16.4
2	10	9.6	9.4	9.1	9	9.4	9.6	9.8	10.8	10.3	9.8	9.6
3	6.3	5.6	5.1	4.7	4.7	6.3	6.8	7.4	9.8	7.6	6.8	6.3
4	-1.2	-2.1	-3.1	-3.8	-3.6	1.3	2.9	3.8	11.1	3	0.8	-0.1
5	-2.9	-4.1	-4.8	-5.5	-5	0	2.5	3.5	9.5	1.6	-0.1	-0.9
6	-2.1	-3.7	-4.6	-5.2	-4.8	-0.4	4.8	6.1	8.3	1.9	0.4	-0.2

The results of studies of temperature changes in various sections of the structure of external walls before repair are shown in Table 2.

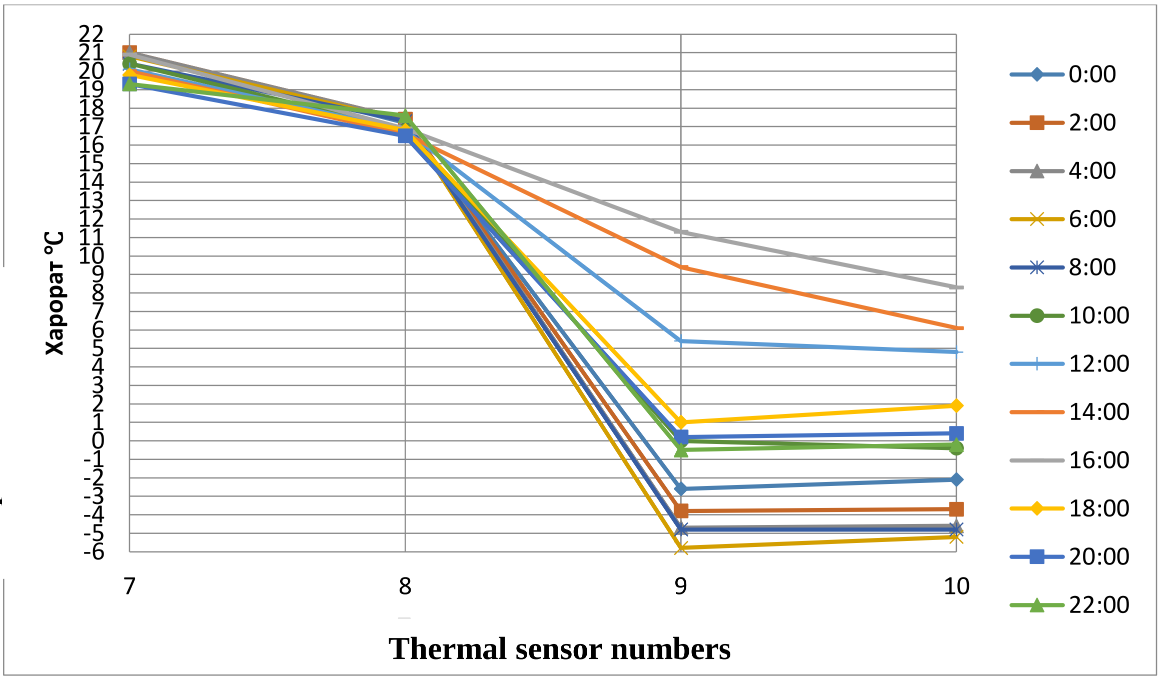


Diagram 2. Temperature differences in various sections of the external wall structure before renovation.

Table 2.

Thermal sensor	Time											
	0:00	2:00	4:00	6:00	8:00	10:00	12:00	14:00	16:00	18:00	20:00	22:00
7	21	21	21	20.8	20.4	20.4	20.1	20	20.9	19.8	19.3	19.3
8	17.2	17.4	17.4	17.3	17.3	16.8	16.8	16.6	16.9	16.8	16.5	17.6
9	-2.6	-3.8	-4.7	-5.8	-4.8	0	5.4	9.4	11.3	1	0.2	-0.5
10	-2.1	-3.7	-4.6	-5.2	-4.8	-0.4	4.8	6.1	8.3	1.9	0.4	-0.2

Picture 1. Illustrates the initial studies were held in summer and winter. During the observation used modern measuring instruments that passed metrological tests.

Temperature changes were recorded from the measuring instruments every 2 hours on the hottest 5 summer days and the coldest days of winter.

4. Conclusion and proposal

According to the obtained results, the design and reconstruction of brick buildings can be cause of increasing energy efficiency by actively influence temperature changes in various sections of the external wall structure, using facade ceramic tiles with an ECOVER 50 mm insulation layer and an air gap of 50 mm above the external enclosing structures.

Ceramic facade tiles on the facade surface enrich the external and architectural appearance of the building and save money on the current reconstruction of the facade.

The considerations mentioned above once again confirm the importance of introducing efficient energy-saving advanced design solutions in the design, construction and renovation of buildings. This also lead to, fuel savings that are currently lacking.

Ceramic facade tiles and ventilated air layer shade to the outer surface of the building, subsequently creating a normal indoor climate even in summer. This situation leads to less of using refrigerators and air conditioners that are utilized in summer, as a consequence of, we can save energy not only in winter, but also in summer.

5. The list of used literature

1. The first President of the Republic of Uzbekistan I.A. Karimov. Resolution №2343. May 5, 2015 №2343 "On the program of measures to introduce energy-saving technologies and reduce energy consumption in the economy and social sphere for 2015-2019".
2. Resolution №4422. President of the Republic of Uzbekistan dated August 22, 2019 "On operational measures to improve energy efficiency in the economy and social sphere, the introduction of energy-saving technologies and the development of renewable energy sources".
3. Building resolution 2.01.04-97*. Construction heat engineering / State Committee for Architecture and Construction of the Republic of Uzbekistan; Tashkent: 2011 (pg 98).
4. http://www.ecover.uz/product/12