IMPROVEMENT OF ENERGY EFFICIENCY OF LOW-RISE RESIDENTIAL BUILDINGS AND FEATURES OF TECHNOLOGICAL SOLUTIONS

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Currently, existing buildings have a very low energy efficiency class. Many foreign countries are already actively using energy-saving technologies. The best indicators are observed in Germany. Germany is a recognized world leader in energy and resource saving, even though the share of alternative energy sources is about 16%, while in Austria this figure reaches 70% [1].

Reducing material and energy costs both during construction and during the operation of various buildings, especially for housing and civil purposes, is an important task of the construction complex. Considering that about half of all energy consumption in the country falls on buildings and structures, an urgent problem is to increase the energy efficiency of both newly constructed buildings and the existing significant fund of residential and public buildings that do not meet modern energy consumption requirements [2].

With all the variety of ways to save energy in buildings, they can be reduced to the following main groups:

– optimization of architectural, and space-planning solutions;
– optimization of enclosing structures;
– improvement of engineering systems and equipment;
– widespread use of non-traditional energy sources and, first of all, solar.

Each of these areas contributes to reducing the energy consumption of buildings. Together with

However, taking into account significant (up to 45%) heat losses through external walls, floors and roofs (up to 22%), it should be especially noted that their reduction is a task of great importance [3-7].

It is clear that it is practically impossible to meet modern requirements for building envelopes in terms of thermal protection only by increasing the thickness of external walls and roofing, and it is not advisable at all. So in the case of using traditional structural and thermal insulation materials without additional thermal insulation, according to the newly introduced building codes for thermal protection, brick walls will have to have a thickness of more than 1.26 m, single-layer coatings of structural and thermal insulation cellular and lightweight concrete with a density of 800-1200 kg/m^3 - 0.4 -0.94 m, and in the case of using expanded clay backfill in the roofs, the thickness of the insulation will be 0.44-0.55 m. And this is only for the second level of thermal protection of buildings at 2000-3000 degree days of the heating period.

The use of enclosing structures made of such materials is currently not economically and technically feasible, since this will lead to a significant increase in the consumption of material and energy resources in construction. In addition, an increase in the thickness of enclosing structures when using traditional structural and heat-insulating materials can lead to a sharp increase in the dead weight of buildings and structures and, accordingly, seismic load, which is unacceptable. Therefore, today it is necessary to develop in every possible way research, production base and the use of effective heat-insulating materials and multilayer enclosing structures, in particular, using local materials.

Thus, the introduction of increased requirements for the thermal protection of buildings requires a fundamental revision of issues related to the design and technological solutions of building envelopes and the physical and mechanical properties of the heat-insulating materials used. Wall barriers made of traditional materials (brick, structural and heat-insulating lightweight and cellular concrete with a density of 800-1400 kg/m^3, etc.), which simultaneously perform load-bearing and heat-insulating functions in single-layer structures, can no longer be used without additional using effective thermal insulation materials. Following KMK 2.01.04-97, effective heat-insulating materials include materials with a thermal conductivity coefficient of AO = 0.1 W/(m*°C) and less, and traditional wall materials have AO = 0.21-0.56 W/(m*°C).

The introduction of fundamentally new approaches to the design of enclosing structures opens up the possibility of a significant reduction in their own weight through the use of effective heat-insulating materials and enclosing structures.

One of the more effective and simple ways can be the development of structural and technological solutions for earthquake-resistant and energy-efficient buildings with the integrated use of monolithic foam concrete with a minimum allowable (should be established) low strength and, accordingly, with a reduced density (within 200-300 kg/m^3) as insulation, arranged in construction conditions, and as a carrier layer of brick (well masonry), monolithic light or heavily reinforced concrete. it is more efficient to use foam concrete blocks with a density of 1000-1200 kg/m^3 as a carrier layer, which will further increase the heat-shielding performance of the walls.

For low-rise construction of residential and public buildings (up to 3 floors), it is promising to develop complex wall structures using foam concrete blocks with a density of up to 600 kg/m^3 as load-bearing layers, and monolithic foam concrete with a density of up to 300 kg/m^3 as a heat-insulating layer. This will significantly increase the heat-shielding performance and significantly reduce the dead weight of buildings [8-11].

Obtaining foam concrete of high mechanical strength is one of the important technological tasks of our time. An analysis of the factors affecting the mechanical properties of this composite material shows that the degree of defectiveness of interpore partitions, which determines the strength of hardened concrete, depends very significantly, other things being equal, on the properties of the binder used. When using mass-produced Portland cement M400, for several reasons, foam concrete is characterized by relatively low strength at a certain density, as well as high rates of shrinkage deformations.

Improving the standards of earthquake-resistant construction, taking into account the provisions, will also ensure energy efficiency in the production of structural materials (concrete, cement, steel) by saving them and reducing the seismic load due to the use of lightweight enclosing structures.

In general, the achieved level of thermal protection of buildings according to the newly introduced building codes is 1.4-4.0 times higher than the level of regulatory requirements of the Soviet period. At the same time, this level is on average 2 times lower than in the EU countries [12-20]. The accepted levels of thermal protection of buildings are due to the current state of development of the country's economy, and the material and technical base for the construction and operation of buildings and structures. At the same time, international practice and experience of a phased reduction in energy consumption by buildings in developed countries were taken into account. Therefore, it is necessary to continue research on the systematic improvement and development of the regulatory and methodological framework for the design and construction of energy-efficient buildings, taking into account the development of the country's economy, the need to stimulate the development of the production base of effective heat-insulating materials,

List of used literature

1. KMK 2.01.04-97* Building heat engineering. GosArchitektStroy. Tashkent AQATM.-20P.-98s.
2. Казакова, Е. В., & Кузин, Н. Я. (2021). Зарубежный опыт строительства энергоэффективных зданий. *Аллея науки*, *1*(1), 225-229.
3. Крылов, Б. А., Орентлихер, П. П., & Асатов, Н. А. (1993). Бетон с комплексной добавкой на основе суперпластификатора и кремнийорганического полимера. *Бетон и железобетон*, *3*, 11-13.
4. Bozorovich, N. M., Ugli, K. Z. M., Ibragimjanovna, L. M., Ugli, A. A. A., Ugli, E. K. R., & Ugli, R. M. F. (2019). Obtaining and researching of thermoelectric semiconductor materials for high-efficienting thermoelectric generators with an increased efficiency coefficienT. *Проблемы современной науки и образования*, (12-2 (145)), 69-73.

5. Mukhtarovna, N. R., & Botiralievich, U. N. (2021, January). Energy saving stone fruit drying technology. In *Euro-Asia Conferences* (Vol. 1, No. 1, pp. 248-251).
6. Yang, S., Cho, H. M., Yun, B. Y., Hong, T., & Kim, S. (2021). Energy usage and cost analysis of passive thermal retrofits for low-rise residential buildings in Seoul. *Renewable and Sustainable Energy Reviews*, *151*, 111617.
7. Dekhkanov, S. A. (2020). Prospects for the development of foreign economic activity of the United Arab Emirates and the republic of Uzbekistan: modern realities, innovations and development strategies. *ISJ Theoretical & Applied Science, 04 (84)*, 926-929.
8. Атоев, Э. Х., & Бердиева, З. М. (2021). Изучение устойчивости комплексных соединений металлов с некоторыми фосфорорганическими лигандами. *Universum: химия и биология*, (10-2 (88)), 6-8.
9. Axmedov, B. M. (2022). Knauf Insulation is Effective Isolation. *Central Asian Journal of Theoretical and Applied Science*, *3*(6), 298-302.
10. Соломатов, В.И., Мамажонов, А.У., Давлятов, Ш.М., & Косимов, Л.М. (2022). Технологическая поврежденность бетонов и ее влияние на эксплуатационную долговечность бетона. *Научно-технический журнал ФерПИ*, *26*(3), 123-133.
11. Axmedov, J. J., Qosimova, S.F. (2022). Zamonaviy ko'p qavatli turar-joy binolari va ijtimoiy-madaniy tuzilmalarni loyihalash tajribasini o'rganish. *Scienceweb academic papers collection*.
12. Sh, K. S. (2022). Development of the composition of the anti-inflammatory collection “Diabderm”. *Редакційна колегія*, *22*.
13. Рахматов, М. С., Бердиева, З. М., & Адизова, Н. З. (2013). Перспективы атмосферных оптических линий связи нового поколения. In *Современные материалы, техника и технология* (pp. 134-135).
14. Дехканов, Ш. (2021). Қурилиш маҳсулотлари саноати акциядорлик жамиятларида корпоратив бошқарувнинг ташкилий-иқтисодий механизмларини такомиллаштириш. *Экономика и образование*, (5), 118-125.
15. Ташланова, Н. Д. (2018). Формирование навыков при выполнении самостоятельных работ студентов в высших учебных заведениях. *Мировая наука*, (4), 238-240.
16. Adilhodzhaev, A., Igamberdiev, B., Kodirova, D., Rakhmonov, O., & Marufjonov, A. (2020). Assessment of the potential of composite gypsum binder bricks as an alternative to traditional wall materials in Uzbekistan. *European Journal of Molecular & Clinical Medicine*, *7*(2), 1884-1889.
17. Kim, K. S., Yoo, D. C., Choi, C. H., & Jang, H. I. (2020). Development of Energy Variable Definition and Reference Model for Predicting Energy Consumption of Low-rise Residential Buildings. *Journal of the Architectural Institute of Korea*, *36*(12), 199-208.

18. Adilhodzhaev, A., Igamberdiev, B., Kodirova, D., Rakhmonov, O., & Marufjonov, A. (2020). Assessment of the potential of composite gypsum binder bricks as an alternative to traditional wall materials in Uzbekistan. *European Journal of Molecular & Clinical Medicine*, *7*(2), 1884-1889.
19. Sabirovich, I. A., Bazarov, A. A., & Sodiqovna, O. M. (2022). Study of the Distribution and Physico-Chemical Properties of Deep Groundwater in Some Areas of the Altiaryk and Besharik Districts of the Fergana Region and Their Rational Use. *Eurasian Journal of Engineering and Technology*, *5*, 120-124.
20. Кодирова, Д. Т., Омонова, М. С., Тожимаматова, М. Ё., & Убайдуллаева, С. Б. (2022). Физико-химические процессы при получение магнезиальных вяжущих из доломитов шорсу. *Oriental renaissance: Innovative, educational, natural and social sciences*, *2*(5), 1243-1247.