



IMPROVING RESIDENTIAL BUILDINGS IN UZBEKISTAN THROUGH ENERGY-EFFICIENT SOLUTIONS

Akhmedova Firuza Ma'rufjonovna

Lecturer, Department of Engineering and Computer Graphics

Chirchik State Pedagogical University

Abstract

This article discusses the methods of natural cooling of residential buildings during the hot period of the year. These methods have been used since past times in the geographical regions of Central Asia, and research conducted on this topic in foreign countries is also presented. Furthermore, it is shown how the natural cooling techniques used in past times can be applied to modern low-rise and multi-story residential buildings.

Keywords: Badgir, wind-catcher, tabadan, tunnel, geothermal energy, north.

O'ZBEKISTON TURAR-JOY BINOLARINI ENERGIYA TEJAMKOR YO'LLAR BILAN TAKOMILLASHTIRISH

Axmedova Firuza Ma'rufjonovna

Chirchiq Davlat Pedagogika Universiteti

“Muhandislik va Kompyuter grafika” kafedrası o'qtuvchisi

Annotatsiya:

Ushbu maqolada yilning issiq davrida uylarning tabiiy sovutish usullari haqida yozilgan. Bu usullar Markaziy Osiyo geografik hududlarida qadimdan qo'llanib kelgan va shu mavzu bo'yicha xorijiy davlatlarda olib borilgan tadqiqotlar ham keltirilgan. Shuningdek, eski davrlarda uylarni tabiiy sovutishda qo'llanilgan usullar, zamonaviy kam qavatli va ko'p qavatli turar joy binolariga qanday tatbiq etish mumkinligi ko'rsatilgan.



Kalit so'zlar: Badgir, shamol-tutqich, tabadan, tunel, geothermal muhit, shimol.

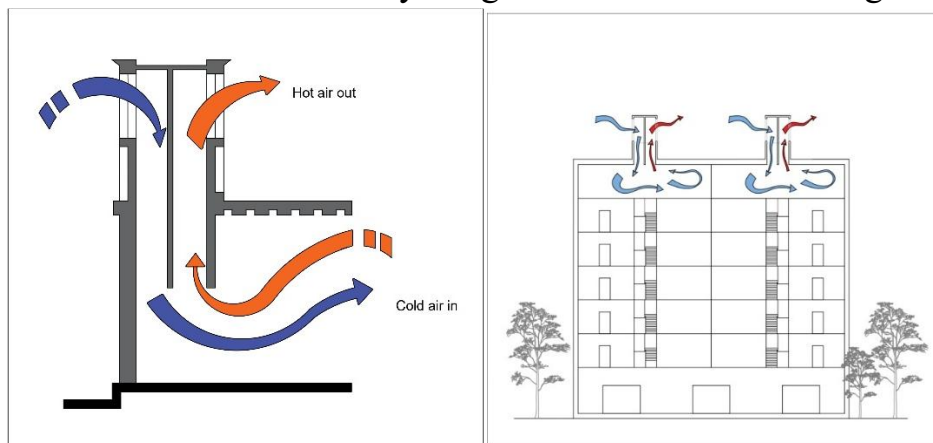
Аннотация:

В данной статье рассматриваются методы естественного охлаждения жилых домов в жаркий период года. Эти методы применялись с давних времен в географических регионах Центральной Азии, а также приведены исследования, проведённые по данной теме в зарубежных странах. Кроме того, показано, как методы естественного охлаждения домов, используемые в древние времена, можно применять к современным малоэтажным и многоэтажным жилым зданиям.

Ключевые слова: Бадгир, ловушка ветра, табадан, тоннель, геотермальный источник, север.

Today, construction work in Uzbekistan is progressing at a rapid pace. Modern residential buildings are being erected in every region and city. Although these new housing complexes are equipped with all necessary amenities, the issue of energy saving has not yet been fully addressed.

Therefore, in order to find alternative solutions for modern residential buildings that do not consume excessive energy, the architectural solutions of past residential structures were continuously studied. In this process, attention was paid not only to earlier housing models in Uzbekistan, but also to international experience. In particular, the *badgir* (windcatcher) systems of the city of Yazd in Iran were taken as a model for today's high-rise residential buildings.





***Modern American Journal of Engineering,
Technology, and Innovation***

ISSN(E): 3067-7939

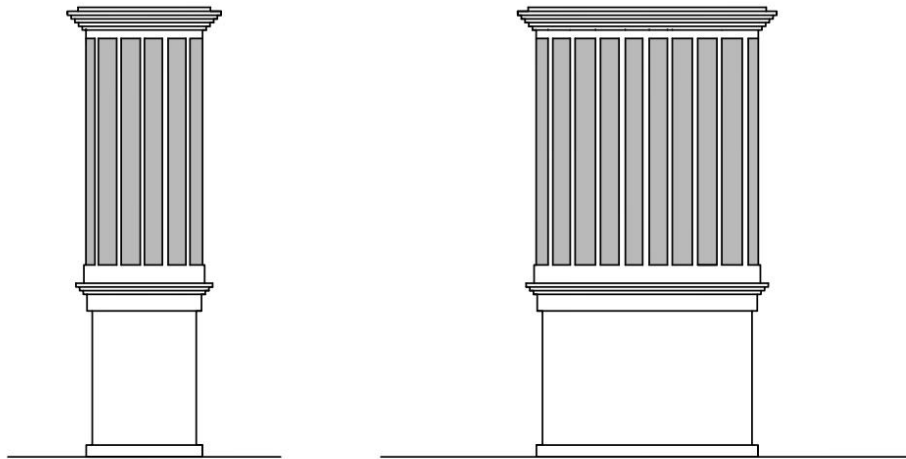
Volume 01, Issue 07, October, 2025

Website: usajournals.org

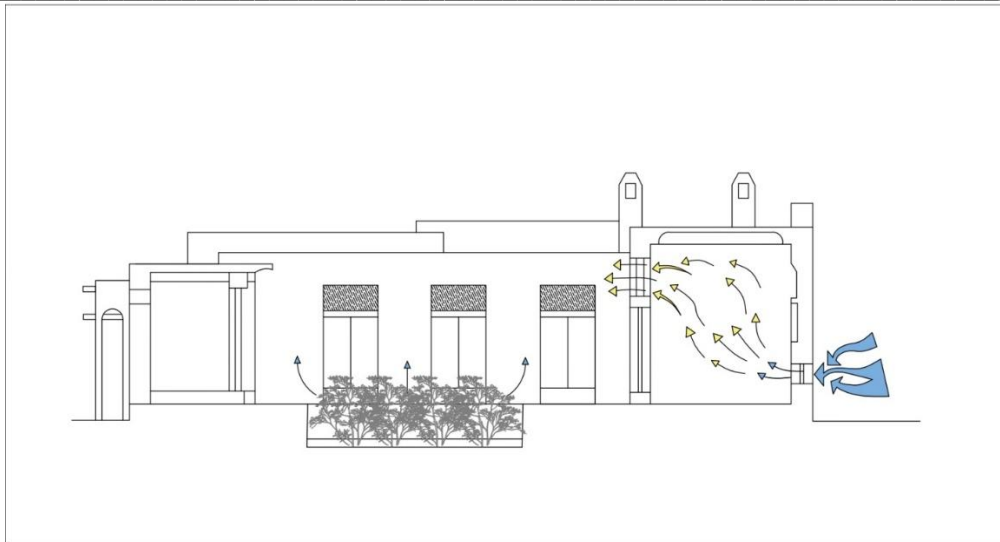
*This work is Licensed under CC BY 4.0 a Creative Commons Attribution
4.0 International License.*

In this case, such badgirs (windcatchers) are installed on the roof of a 4- or 5-story residential building, and the building is oriented toward the north. This is because the cool air flowing from the north enters the building through the badgir, pushes out the warm air, and creates a pleasant and cool microclimate inside.

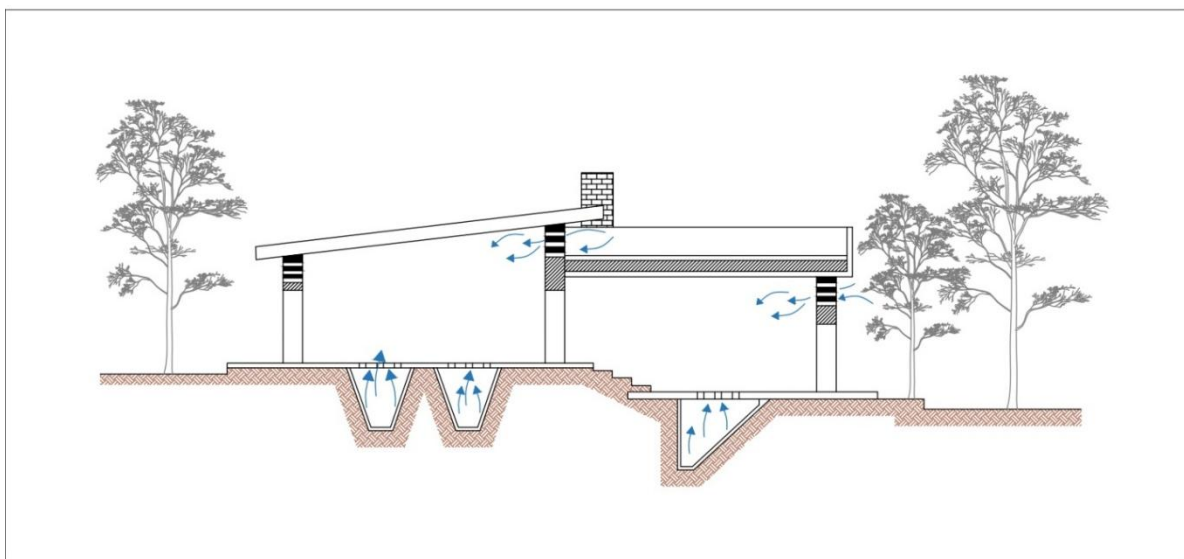
The badgirs (windcatchers) are installed on the roof of the building in the form of a chimney, and their interior is divided into two sections: cool air enters from the side facing north, while warm air exits from the other side.



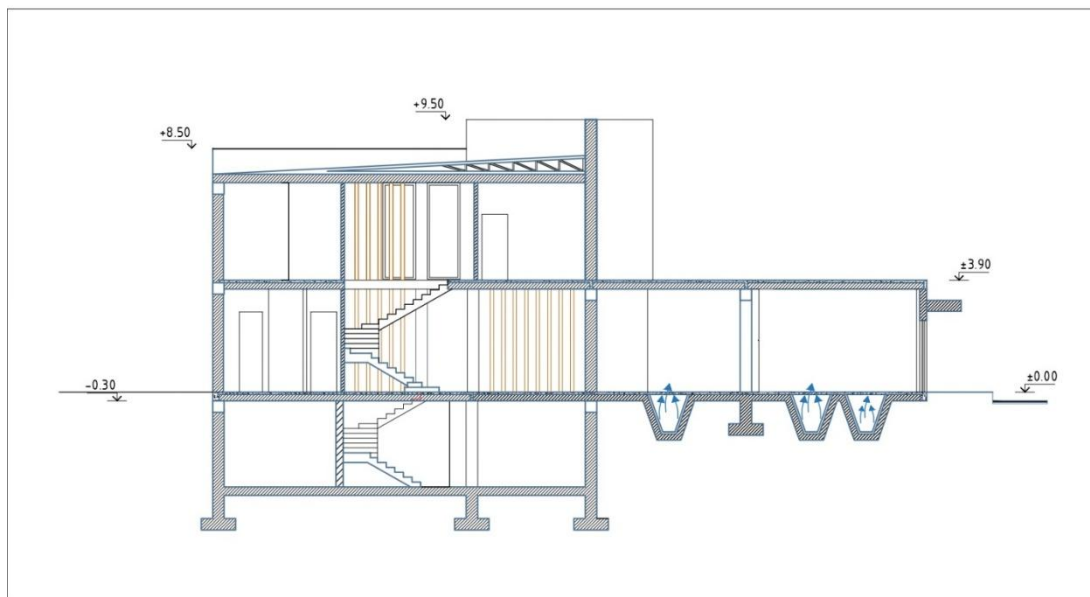
Additionally, alternative solutions were explored for low-rise houses as well. For this purpose, the Khorezm, Bukhara, Fergana and Tashkent regions and cities of Uzbekistan were studied. Research revealed that a method previously used in the city of Bukhara, but later abandoned, can be reapplied in today's low-rise residential buildings. One of the unique architectural solutions found in certain Bukhara-type houses is called *tabadan*. Tabadan is an opening located 30–40 cm above the foundation of the house on the exterior wall. There is a similar opening on the opposite wall, but it is positioned 30–40 cm below the ceiling. Cool air from outside — that is, from the street — enters the house through the lower opening, while the warm indoor air exits through the upper opening. In this way, a pleasant and cool microclimate is created inside the house.



Another unconventional method can also be found in Bukhara-style houses. This involves digging tunnels downward from the foundation of the house and planting various plants inside them. This method not only creates a cool airflow inside the house but also adds aesthetic beauty to the building. However, this technique is applied only in the courtyard of the house. A similar method is also observed in foreign countries, but there the tunnels are dug inside the house rather than in the courtyard. These tunnels create a geothermal environment within the house. Additionally, there are openings located beneath the ceiling which help regulate the indoor temperature.



The possibility of applying this method, used in foreign practice, to modern low-rise buildings was analyzed, and a proposal project for its implementation was developed. In this case, tunnels are also dug downward from the foundation in low-rise houses in the same manner, with a length of 50–60 cm. The function of these tunnels is to ensure a geothermal temperature inside the house.



REFERENCES

1. Rural residential buildings in the south of the country | A.A. Makhkamov.
2. Handwritten informations from Archive
3. Akhmedova Firuza Ma'rufjonovna & Nazarova Dinara. (2024). Territorial characteristics of traditional residential buildings in Uzbekistan (Khorezm and Bukhara) | Journal of Universal Science Research, 2(5), 194–198.
4. https://www.researchgate.net/figure/Badgir-elevations-and-section-wind-catcher-source-Federico-Minelli-ICHHTO-Cultural_fig4_325315061