

THE USE OF DECORATIVE TILE-COVERED THERMAL PANELS FOR BUILDING FAÇADE INSULATION

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Annotation: This paper explores the advantages of using tiled thermal panels in modern construction. These panels combine insulation, durability, and aesthetic value, making them ideal for energy-efficient and visually appealing buildings. The integration of traditional Uzbek ceramic designs into modern thermal panel systems offers a unique blend of national identity and contemporary architectural needs. Tiled thermal panels are cost-effective, environmentally friendly, and suitable for various building types, highlighting their potential as a practical local construction material.

Keywords: Facade, tile, thermopanel, insulation, design, penoplex, glaze.

Tile work, or tile art, is an integral part of Central Asian architectural art that encompasses the decoration of buildings with tiles and the craft of tile making. Since the 14th century, this technique has become widespread in Central Asia, carried out by specialized craftsmen. These artisans prepared tiles from clay, glazing them and subjecting them to a firing process in a kiln. Tiles decorated with patterned flowers were fired again to enhance their durability.



The process of covering buildings with tiles and creating decorative patterns has evolved over time. In each region, examples of tile work are distinguished by unique colors and styles. During the 14th to 16th centuries, tiled decorations were widely used in palaces, mosques, madrasas, and mausoleums. Numerous ancient buildings, such as the Kukeldash Madrasa in Tashkent, the Pakhlavan Mahmud Mausoleum in Khiva, the Khan Palace in Kokand, and the Registan Square in Samarkand, attest to this.

These architectural monuments continue to be preserved today as cultural heritage, and their beauty is recognized on an international level. The words of our ancestor Amir Timur, “If you want to see our power, look at the buildings we constructed,” further emphasize the significance of this architectural art. The art of tile work is not only important aesthetically but also expresses our historical and cultural heritage.

Yes, that's correct. Your thoughts on the issues of heat retention in Uzbekistan's historical architecture and buildings are very important. Various methods have been

employed to address these longstanding challenges. The use of thick walls, solid bricks, clay coatings, and plastered finishes has certainly played a significant role in heat retention.

Today, the implementation of energy-saving technologies and the development of renewable energy sources are crucial for Uzbekistan's sustainable development. The measures outlined in the presidential decree dated September 9, 2022, include initiatives aimed at increasing energy efficiency and addressing ecological issues. This will undoubtedly help improve the thermal insulation of modern buildings and reduce energy consumption.

Such approaches are not only economically beneficial but also significant for environmental protection. Preserving Uzbekistan's historical heritage while enhancing energy efficiency through the application of modern technologies is an important task.

Modern architecture truly demands cost-effective, aesthetically pleasing, and environmentally friendly solutions. The use of new materials and technologies is crucial for energy conservation and ecological sustainability. Choosing energy-efficient and locally produced materials instead of traditional construction materials not only reduces energy consumption but also proves to be economically beneficial. For example, materials like polystyrene concrete, aerated concrete, and foam concrete are lightweight and possess excellent insulation properties, making buildings more comfortable in both winter and summer.

Additionally, modern materials such as composite reinforcements and drywall speed up the construction process and enhance quality. Dry construction mixtures simplify work processes and help save time.

Environmentally friendly materials, such as cotton-based and reed-based panels, increase the use of natural resources while allowing construction without harming the environment.

At the same time, it is essential to implement innovative solutions and technologies in building design to enhance energy efficiency. This will not only bring innovations to the fields of architecture and design but will also positively impact the overall development of the construction industry.

Thus, focusing on energy efficiency and ecological cleanliness in modern architecture will be one of the key factors for sustainable development in the future.

He insulation of a facade is the key to building a comfortable and economical home. Insulation is not just a step in the process of constructing or renovating a house; it is an entire strategy that affects many aspects of residents' lives. Choosing the right thermal insulation not only ensures a comfortable indoor environment but also significantly reduces heating costs, extends the lifespan of the building, and can even positively impact the health of its occupants.

Why is proper home insulation important? In modern homes, heat loss through walls and various construction joints can reach up to 30%. This means a significant portion of heat escapes outside, leading to increased heating expenses. Choosing the right insulation helps reduce these losses and allows for the creation of a comfortable indoor climate.

There are many types of insulation materials available on the market, such as mineral wool, extruded polystyrene foam, PIR (polyisocyanurate) boards, and others. Each of these materials has its own advantages and disadvantages, and the choice depends on specific working conditions, the climatic characteristics of the region, and architectural solutions.

The Variety of Insulation Materials

1. Mineral Wool Mineral wool is one of the most popular insulation materials due to its high thermal insulation and fire resistance. It is ideal for walls and roofs but requires protection from moisture, as it can lose its insulating properties when wet.

2. Extruded Polystyrene Foam (EPS) EPS has low thermal conductivity and high strength. It is moisture-resistant, making it ideal for insulating foundations and basements. However, it is not suitable for areas prone to mechanical damage.

3. PIR Boards PIR (polyisocyanurate) boards are a modern insulation material with a high level of thermal resistance. They are moisture-resistant and lightweight, making installation easier. However, they can be more expensive compared to other materials.

4. Polyurethane Foam Applied in spray form, polyurethane foam creates a seamless layer, providing excellent thermal insulation and moisture protection. However, it requires professional installation.

Internal or External Insulation? Insulation can be applied either from the inside or the outside of a building. Internal insulation has its benefits, such as the ability to install it at any time of the year, regardless of weather conditions. However, it can lead to condensation on the walls, which may cause mold and mildew over time.

External insulation is generally preferred, as it creates a “thermal shell” that protects the walls from external temperature fluctuations. This approach also prevents condensation from forming inside the rooms.

Another Key Requirement of Modern Architecture: Aesthetics

Modern aesthetics is undoubtedly one of the leading demands of today's market, and architecture is no exception. In contemporary architecture, the reflection of national traditions i.e., the harmony between modernity and national identity adds a unique charm to Uzbek architecture. Therefore, when choosing insulation, it is important to consider not only its thermal insulation properties but also how it complements the design features of the home.

When selecting insulation, the following factors should be taken into account:

- Wall materials

- Wind loads
- Finishing materials

Facade insulation is a crucial stage of construction and renovation, requiring careful attention and consideration of multiple factors. The right choice of insulation and its installation method will ensure warmth in winter, coolness in summer, and optimal humidity levels throughout the year.

It is important to remember that a professional approach to insulation not only enhances comfort but also reduces heating costs and makes the overall design of your living space more efficient and durable. Undoubtedly, modern aesthetics is one of the leading demands of today's market, especially in the field of architecture. At the same time, the integration of national traditions into contemporary architectural design – the harmony of modernity and cultural identity – adds a unique beauty to Uzbek architecture.

Therefore, we must strive to give a national appearance to new types of locally produced building materials. In this regard, I propose transforming decorative glazed ceramic tiles, traditionally crafted by master potters, into heat-retaining thermopanel. This approach would preserve cultural heritage while meeting modern standards of energy efficiency and design.



Thermal Panels: An Integrated Insulation System

Thermal panels represent a unified, integrated system composed of three main components. The first is the insulation layer, which is reliably protected from external environmental influences and mechanical impact by the second component – decorative facing tiles. The third component is a structural layer that ensures the rigidity and durability of the thermal panel.

General Structure of Facade Thermal Panels

The facade panels typically have the following design:

1. Polyurethane foam insulation
2. Outer layer made of glazed ceramic tiles
3. Rigid base layer (OSB – Oriented Strand Board)

Thanks to this design, thermal panels are easy to transport and install, while offering exceptional thermal insulation properties. For this reason, sandwich panels serve not only as a reliable and durable facade covering, but also act as a “thermos-type” insulation for the entire house.

Finishing a house facade with these panels allows for the aesthetic effect of brickwork, indistinguishable in color and texture from real bricks, while providing enhanced energy efficiency.

Advantages of Using Thermal Panels in Construction

1. Economic Efficiency: Thermal panels are comparable in price to other finishing materials, but their use significantly reduces heat loss, ensuring a record level of thermal insulation efficiency.

2. Durability: Thermal panels have a long service life and do not require cosmetic repairs or special maintenance.

3. Superior Thermal and Performance Characteristics:

- High thermal insulation capability
- Surface hardness and resistance to mechanical damage
- Environmentally friendly materials
- Minimal construction time

4. Versatility and Compatibility: Thermal panels are suitable for walls of any thickness and material. Their low weight allows them to be used for finishing older houses with weak foundations, while their strong and rigid structure makes them ideal for frame house construction.

5. Year-Round Installation: Glazed tile thermal panels can be installed in any season, making them practical and convenient for various climate conditions.

6. Structural Flexibility: The flexibility of the panels prevents cracks and fractures caused by seasonal ground shifts or foundation movement.

7. Wide Range of Designs: Panels come in a variety of textures and colors, allowing for diverse aesthetic solutions.

8. Low Mechanization Requirements: Installation does not require heavy machinery, reducing labor and cost.

9. Resistance to Biological Damage: Tiled thermal panels are not susceptible to insect damage and are resistant to mold and mildew. They also offer:

- High strength
- Lightweight construction

- Excellent thermal insulation
- High resistance to screw pull-out

In conclusion, tiled thermal panels are an exceptionally convenient and comprehensive local building material, combining practicality, aesthetics, and efficiency.

In modern construction, energy efficiency, aesthetic appearance, and functional convenience are among the most important requirements. Tiled thermal panels, as a building material, play a significant role in meeting these demands. They offer numerous advantages such as high thermal insulation, durability, ease of installation, environmental friendliness, and visual appeal. Moreover, thermal panels provide an opportunity to harmonize local architectural traditions with modern technologies. In particular, using glazed tiles decorated with national patterns not only ensures effective thermal insulation but also enriches the facade with artistic beauty. This represents an effective way to achieve a balance between modernity and national identity in Uzbek architecture.

In conclusion, tiled thermal panels embody all the key features required by contemporary architecture – thermal efficiency, cost-effectiveness, strength, and beauty – making them a promising and practical construction material.

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