

Analysis Of Current Building Codes And Regulations For The Installation Of Energy-Saving Technologies.

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Abstract: *With increasing global energy demands and diminishing fossil fuel reserves, the need for renewable energy sources and energy-saving technologies has become urgent. In Uzbekistan, the focus has shifted toward integrating solar energy and other renewable sources into building structures to reduce reliance on traditional energy forms. Presidential Decree №UP-220 (2022) sets forth guidelines for promoting renewable energy and energy efficiency in new and renovated buildings. This paper analyzes the existing building codes, evaluates the loads and effects on structures from energy-saving installations, and proposes revisions to national standards, particularly regarding structural load requirements.*

Keywords: energy-saving technologies, solar panels, wind and snow loads, renewable energy integration, load-bearing capacity, energy efficiency.

Introduction:

Energy consumption continues to rise globally as nations develop, leading to the depletion of fossil fuel reserves. Renewable energy, especially solar, wind, and geothermal, offers cleaner alternatives, contributing to energy security and environmental sustainability. For Uzbekistan, solar energy is particularly suited to the regional climate, with laws and regulations mandating the integration of energy-saving technologies in construction projects.

Presidential Decree №UP-220 outlines the mandatory use of renewable energy technologies, including solar water heaters and photovoltaic systems, for at least 25% of energy needs in new construction starting from 2023. This study seeks to analyze how current building norms account for the structural implications of installing these technologies and propose necessary updates to existing regulations.

Methods:

This study involves a thorough review of Uzbekistan's building codes, specifically СНиП 2.01.07-1996 "Loads and Impacts," which governs construction design parameters, and other relevant regulations. In parallel, mathematical calculations were conducted to evaluate the physical impact of energy-saving installations—solar panels and water heaters—on building structures. The analysis covered wind, snow, and additional loads from solar systems to establish whether current building regulations adequately address these new requirements.

Results:

3.1. "Structural Load Analysis"

The frame of a standard 415-Watt solar panel (2 m²) exerts a load of approximately 19 kg, with a wind load of up to 36,000 Pa and snow resistance of 54,000 Pa. A system designed to generate 12 kW of energy requires 30 solar panels, covering approximately 60 m² and imposing a total weight of 570 kg.

Solar water heaters, with an average volume of 230 liters, weigh approximately 312 kg. This adds a load of 130 kg per m² on the roof surface. The cumulative weight, including mounting structures, can significantly affect the design of roofing systems.

3.2. "Building Codes Evaluation"

Existing building norms (СНиП 2.01.07-1996) adequately address traditional loads like snow and wind but do not account for the cumulative impact of energy-saving technology installations. The integration of photovoltaic and solar thermal systems introduces additional loads, requiring code revisions to ensure structural safety.

Discussion:

The study indicates that while renewable energy installations bring numerous benefits, such as reduced energy costs and lower carbon footprints, they also present significant structural challenges. The inclusion of solar panels and water heaters increases the external load on buildings, which current regulations do not sufficiently address. This necessitates updating building codes to incorporate these new technologies, including detailed provisions for load-bearing capacities and safety margins.

Given Uzbekistan's goal of generating 4300 MW of renewable energy and saving 4.8 billion cubic meters of natural gas by transitioning to alternative energy, updating СНиП 2.01.07-1996 to reflect the structural realities of modern energy-saving technologies is critical.

Conclusion:

The growing emphasis on integrating renewable energy sources into building structures requires an immediate revision of existing building codes to account for the additional loads imposed by energy-saving technologies. This study highlights key areas

where building regulations should be enhanced, ensuring that structures can safely support solar panels and water heaters, thus facilitating Uzbekistan's transition to a more sustainable energy system.

References

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