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ENHANCING ENERGY EFFICIENCY ENCLOSING STRUCTURES IN ADMINISTRATIVE BUILDINGS

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Abstract. *Nowadays administrative buildings being a significant part of the urban landscape, consume substantial amounts of energy for heating, cooling, and lighting. This research paper investigates methods to enhance the energy efficiency of administrative buildings, focusing on the critical role of the building's enclosing structures.*

Аннотация. *На сегодняшный день административные здания составляющие значительную часть городской экосистемы потребляют значительное количество энергии для отопления, охлаждения и освещения. В данной статье исследуются методы повышения энергоэффективности административных зданий, уделяя особое внимание важной роли ограждающих конструкций здания.*

Annotatsiya. *Bugungi kunda shahar ekotizimining muhim qismini tashkil etuvchi ma'muriy binolari isitish, sovutish va yoritish uchun katta miqdorda energiya manbalari sarflanadi. Ushbu maqolada ma'muriy binolarning energiya samaradorligini oshirish usullarini o'rganilib unda to'siq konstruksiyalarning muhimligiga e'tibor qaratiladi.*

Keywords: *Administrative buildings, climate zones, enclosing structures, energy efficiency, optimal design, thermal performance, sustainable construction.*

Ключевые слова*: Административные здания, климатические зоны, ограждающие конструкции, энергоэффективность, оптимальное проектирование, тепловые характеристики, экологичное строительство.*

Kalit so'zlar: *Ma'muriy binolar, iqlim zonalari, to'siq konstruksiyalar, energiya samaradorligi, optimal loyihalash, issiqlik ko'rsatkichlari, ekologik qurilish.*

INTRODUCTION. Nowadays energy consumption in office buildings is a major concern due to its environmental impact and financial implications. Commercial buildings, such as office complexes, government offices and institutional organizations, consume significant amounts of energy for various activities, including lighting, heating, cooling, ventilation and electrical operation. Reducing energy consumption in these buildings is critical to achieving sustainability goals and optimizing operating costs [1-3].

Energy consumption in office buildings is influenced by several factors, including building layout, energy management practices, and the efficiency of building systems [4-8]. Understanding and managing these factors can lead to significant energy savings and improved energy efficiency. Currently, many scientific works are devoted to the problems of introducing energy-efficient measures in buildings and considerable attention is paid. However, the development of energy efficient measures in public organizations is not given due importance. In the works of many specialists, the emphasis is on improving the accounting of energy consumption, which, of course, is important, but not enough. To take into account all factors affecting the energy efficiency of a facility, it is necessary to develop comprehensive solutions.

Methods of research. The layout of building structures plays a decisive role in energy consumption. Factors such as building orientation, level of insulation, window-to-wall ratio, and shading devices affect the amount of energy needed for heating, cooling, and lighting. Implementing energy efficient design principles such as passive solar design, efficient building envelope and optimized glazing can minimize energy consumption [7-9].

Effective energy management practices, including energy monitoring, measurement and control systems, can help identify energy saving opportunities and optimize building performance. Implementing energy management systems, conducting energy audits, and regularly tracking energy consumption can support informed decision-making and targeted energy saving initiatives. The use of highly efficient equipment, intelligent controls and the integration of renewable energy technologies can reduce energy demand and promote sustainable development.

Enclosing structures play a critical role in improving the energy efficiency of buildings. They form a building envelope that separates the conditioned indoor environment from the outdoor environment. The design solutions and building materials used in the enclosing structures have a direct impact on energy consumption, heat transfer, air leakage and natural lighting [9-12].

Enclosing structures should be designed and constructed to minimize air leakage. Uncontrolled air infiltration can lead to energy loss and reduced indoor comfort.

The primary focus of this research is to discover the results of heat transfer resistance in structures. The process of justifying thermal imaging involves identifying the thermal characteristics of a structure by combining non-destructive and computational analysis methods for this purpose. This process is conducted through thermal imaging of building facades and engineering equipment, using infrared radiation.

Temperature anomalies are utilized to determine the temperature at the surface of structures and to estimate the heat flow through specified areas.

Additionally, during the study, it has been necessary to measure the temperature of the external and internal air, as well as to evaluate the temperature and intensity of heat flows.

During the thermal engineering survey process, we identified the thermal insulation characteristics of building structures using non-destructive methods and calculations. These approaches revolve around assessing heat transfer resistance and measuring temperatures on the surfaces of the object with thermal imaging equipment.

Results. Reducing thermal energy losses for heating can be accomplished by adding insulation to facades, roofs, ceilings, walls, insulated basements, and technical subfloors. This insulation of enclosing structures effectively curtails heat loss within the building, subsequently

decreasing the amount of thermal energy required from heating sources to maintain standard indoor climate conditions. Consequently, insulation leads to a reduction in energy consumption within the building and, in turn, a decrease in heating expenses. This forms the foundation for cost savings resulting from the implementation of this energy-efficient measure. However, it's essential to note that a reduction in heat loss can be achieved without continuous insulation of enclosing structures, particularly in the case of panel buildings where panel seams may have become void over time. Cement mortar, sealants, and insulation that originally filled the gaps between the slabs may have deteriorated due to temperature fluctuations, precipitation, and wind. Besides impacting thermal characteristics, leaky seams can lead to excess moisture in the premises and the development of mold.

Coating insulation employs modern thermal insulation materials. Before applying the coating insulation, it's imperative to level the base surface. A vapor barrier film is then laid, followed by insulation whose thickness is determined through thermal engineering calculations. A polymer waterproofing membrane is placed atop the insulation to shield the coating from precipitation.

In the case of insulating a flat roof, a two-layer thermal insulation system is typically employed. The bottom layer, considered the primary one, offers high thermal resistance with lower strength, boasting a thickness of 70–170 mm. The top layer, which bears the mechanical load, redistributes it across the flat system and is 30-50mm thick, but it possesses greater strength. This functional allocation between the layers of thermal insulation material substantially reduces insulation thickness and weight while maintaining efficiency.

Conclusion. Enclosing structures must undergo a commissioning process to ensure their performance meets design intent and energy efficiency goals. Commissioning involves testing, adjusting and balancing various elements of the building envelope to optimize energy performance and occupant comfort.

Enclosing structures therefore play a key role in improving energy efficiency by minimizing heat transfer, controlling air leakage, optimizing natural lighting and integrating energy efficient technologies.

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ВЛИЯНИЕ СУПЕРПЛАСТИФИКАТОРОВ НА ФОРМИРОВАНИЕ СТРУКТУРЫ И ПРОЧНОСТНЫЕ СВОЙСТВА БЕТОНА

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Аннотация. *По результатам экспериментальных исследований определено влияние добавок LEVELCON на формирование структуры и прочностные свойства бетона с применением местных строительных материалов. Установлено, что применение таких добавок способствуют формированию плотной структуры на уровне микроструктуры цементного камня и соответственно самого бетона. В результате такого влияния закономерно повышение прочности бетона на сжатие и растяжение с часто применяемыми расходами вяжущего.*

Annotatsiya. *Eksperimental tadqiqotlar natijalari bo'yicha LEVELCON qo'shimchaning mahalliy qurilish materiallari qo'llangan betonning tarkibini shakllanishiga va mustahkamlik xossalariga ta'siri aniqlangan. Bunday qo'shimchalarni qo'llash sement toshining va mos ravishda betonning mikrotarkib darajasidagi zichligini shakllanishini ta'minlaydi. Bunday ta'sir natijasida ko'p qo'llaniladigan sement sarfli betonning siqilishga va cho'zilishga bo'lgan mustahkamligini oshishi aniq xisoblanadi.*

Annotation. *Based on the results of experimental studies, the influence of LEVELCON additives on the formation of the structure and strength properties of concrete using local building materials was determined. It has been established that the use of such additives contributes to the formation of a dense structure at the level of the microstructure of cement stone and, accordingly, the concrete itself. As a result of this influence, there is a natural increase in the compressive and tensile strength of concrete with frequently used binder consumption.*

Ключевые слова: *структура, добавка, бетон, испытание, прочность, суперпластификатор, результат, анализ.*

Kalit so'zlar: *struktura, qo'shimcha, beton, tekshirish, mustahkamlik, superplastifikator, natija, analiz.*

Key words: *structure, additive, concrete, testing, strength, superplasticizer, result, analysis.*

Введение. В настоящее время бетон является одним из самых массово применяемых строительных материалов для строительства зданий и сооружений различного назначения. Бетон это сложный искусственный композиционный материал, которого получают в результате твердения смеси вяжущего, заполнителей и воды. Он обладает различными совершенно уникальными свойствами, поэтому находит широкое применение в самых разных эксплуатационных условиях, так как имеет относительно низкую стоимость. К этим показателям также можно добавить доступность технологии его изготовления, возможность широкого использования местных сырьевых материалов, малую энергоемкость, эксплуатационную надежность и долговечность сборных и монолитных железобетонных конструкций. Бетон остается основным конструкционным материалом современного строительства и ближайшем будущем, замены ему не следует ожидать.

Модифицированный бетон с применением химических добавок позволяет получить достаточный технико-экономический эффект и повысить долговечность бетона за счет существенного влияния на химические процессы гидратации и твердения цемента и бетона. В результате всего этого повышаются его технологические свойства. В настоящее